SD 11
A 10
1960

Report of the Chief of the Forest Service, 1960

United States Department of Agriculture

LIBRARY
OCT 18 1967
ROCKY MOUNTAIN STATION

U.S. Department of Agriculture,
FOREST SERVICE,
Washington, D.C., June 15, 1961.

HON. ORVILLE L. FREEMAN,
Secretary of Agriculture

DEAR MR. SECRETARY:

This, my annual report for 1960, recounts some of the progress and problems of the year. The problems we believe are really opportunities in disguise.

As we enter the decade of the sixties, the nationwide forestry situation offers many solid opportunities. In some aspects, such as the small private forest properties, the opportunities are wrapped in tough problems. But we must tackle these problems and begin turning them into assets if we are to move aggressively toward meeting oncoming needs of a larger population.

Good foundations are in place to build on. The climate of public opinion seems favorable. The Forest Service will do its part in meeting present and future needs of a fast-growing Nation.

The wise use of forest lands and related natural resources is a cause of vital concern to every citizen. Life's essentials spring from these gifts of the earth—land, water, trees, grass, and wildlife. By building up and using these resources intelligently, all people benefit now and a sound heritage is assured for the future.

In this cause we appreciate your leadership and support.

Sincerely,

Richard E. McArdle

RICHARD E. MCARDLE,
Chief, Forest Service.

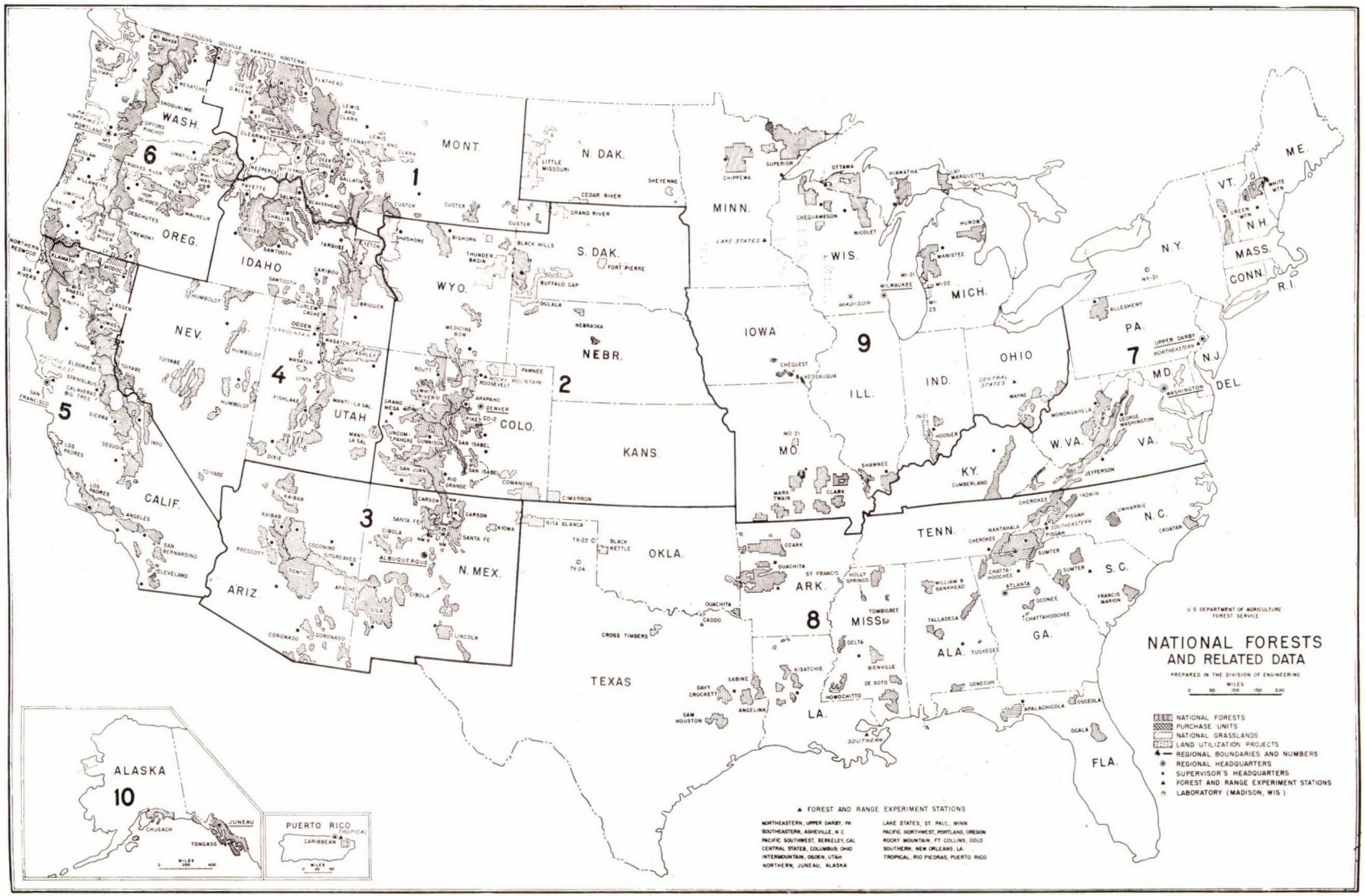
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.
Price 35 cents

Contents

	Page
INTRODUCTION	1
COOPERATION—STATE AND PRIVATE FORESTRY	3
Tree planting	3
Cooperative fire control	5
Cooperative forest fire prevention	5
Forest management	7
Forestry and rural development	7
Pest control	7
Flood prevention	8
FORESTRY RESEARCH	10
Forest management research	11
Forest fire research	11
Watershed management	12
Forest insects	13
Forest diseases	14
Range management and wildlife habitat	14
Forest recreation research	15
Forest economics	15
Forest products utilization	16
Foreign forestry services	16
NATIONAL FOREST RESOURCE MANAGEMENT	18
America's playgrounds	20
Special uses	21
Range management	22
The timber resource	22
Watershed management	24
The wildlife resource	25
NATIONAL FOREST PROTECTION AND DEVELOPMENT	26
National forest fire control	26
Lands	27
Engineering	29
PROGRAM PLANNING AND LEGISLATION	32
Program planning and special projects	32
Legislative reporting	32
ADMINISTRATION	34
Personnel	35
Budget and finance	35
Receipts and expenditures	35
INTERNAL AUDIT	36
STATISTICAL TABLES	37

This report covers calendar year activities unless otherwise identified. Where records are on a fiscal year basis, they are so reported.

Issued August 1961


NATIONAL FORESTS
AND RELATED DATA
PREPARED IN THE DIVISION OF ENGINEERING
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NATIONAL FORESTS
PURCHASE UNITS
NATIONAL GRASSLANDS
LAND UTILIZATION PROJECTS
REGIONAL BOUNDARIES AND NUMBERS
REGIONAL HEADQUARTERS
SUPERVISOR'S HEADQUARTERS
FOREST AND RANGE EXPERIMENT STATIONS
LABORATORY (MADISON, WIS.)
FOREST AND RANGE EXPERIMENT STATIONS
NORTHEASTERN, UPPER DARBY, PA.
SOUTHEASTERN, ASHEVILLE, N.C.
PACIFIC SOUTHWEST, BERKELEY, CAL.
CENTRAL STATES, COLUMBUS, OHIO
INTERMOUNTAIN, OGDEN, UTAH
NORTHERN, JUNEAU, ALASKA
LAKE STATES, ST. PAUL, MINN.
PACIFIC NORTHWEST, PORTLAND, OREGON
ROCKY MOUNTAIN, FT. COLLINS, COLO.
SOUTHERN, NEW ORLEANS, LA.
TROPICAL, RIO PIEDRAS, PUERTO RICO
ALASKA
PUERTO RICO
WASH.
OREG.
CALIF.
IDAHO
NEV.
MONT.
WYO.
UTAH
ARIZ.
COLO.
N. MEX.
N. DAK.
S. DAK.
NEBR.
KANS.
OKLA.
TEXAS
MINN.
IOWA
MO.
ARK.
LA.
WIS.
ILL.
MICH.
IND.
OHIO
KY.
TENN.
MISS.
ALA.
GA.
FLA.
S.C.
N.C.
VA.
W.VA.
PA.
N.Y.
MD.
DEL.
N.J.
CONN.
R.I.
MASS.
VT.
N.H.
ME.

Report of the Chief of the Forest Service, 1960

Introduction

This report covers the first year of a new decade. Many signs pointed to a high plateau of activity and progress for American forestry during the 1960's. Present accomplishments plus plans for accelerated management in the future should serve as solid foundations for unprecedented advances in the field of forestry. The beginning of a new forestry and conservation awakening seems to be abroad in the land. The Nation urgently needs a forestry and natural resource effort surpassing any such effort in the past.

In 1960 the feeling of being on the edge of a higher plateau was evident in all Forest Service activities and thinking. A keener public awareness of forestry, more tree planting and more management, better use and protection of forest resources, and therefore better services and benefits to the American people—all of these make up this higher plateau.

Renewed public interest was shown in many ways. Recreation use was still increasing and more requests were coming in for publications and other information. Pressures were building up for more roads and timber sales. The public showed greater awareness of water supplies, and range users evinced heightened interest. There was a substantial increase in the use of National Forests by hunters, significant progress by the States in many aspects of forestry, and widespread support for faster progress in research.

Additional details will be found in the body of the report. In summary, some of the highlights in 1960 are:

The Fifth World Forestry Congress.—This, the largest international meeting of its kind ever held, took place in Seattle, Wash., from August 29 to September 10, 1960. It was the fifth such Congress to be held and the first in the United States. There were 1,978 participants, including 720 delegates from 71 nations and 9 international organizations. The impact of this successful international gathering will be felt for years. It had many facets. Among the more significant were these:

The multiple use management concept, used as the Congress theme, was introduced to a worldwide audience and enthusiastically received. Recognized by the Congress was the world problem of growing populations pressing upon the forest and natural resource base. This American-developed concept of forest land management was thus presented as one of the hopeful answers to rising population pressures. Favorable reaction of the delegates indicated that multiple use may well have an influence far beyond our own borders.

A symbol of cooperation and understanding among all peoples was the planting of an International Friendship Grove. In an impressive ceremony a representative from each of 65 nations planted a young tree native to or symbolic of his own country. An appropriately worded plaque was unveiled as a permanent record of the event. Bordering the entranceway to the magnificent University of Washington campus where the meeting was held, these trees will grow into a silent but eloquent testimonial to the aspirations of the men of the Fifth World Forestry Congress. The grove will inform future generations. It will tell of how men from around the earth met together for one purpose: to find ways to make the earth's resources better serve all men in peace and friendship.

A world library of useful forestry facts will be the result when the papers and proceedings of the Congress are published. The Proceedings, some 450 papers and related material, are now being readied by the Forest Service for printing in three volumes. This publication, comprising nearly 2 million words, will bring together a comprehensive and authoritative collection of forestry information difficult to match. It will be another significant testimonial to this meeting, adding to the sum of world forestry knowledge and continuing to make its impact for years to come.

The new multiple use-sustained yield law (act of June 12, 1960) was a major legislative landmark in the history of the Forest Service and the management of National Forests. Among other things it specifically directs that the National Forest System will be managed for all five renewable resources: outdoor recreation, range, timber, watershed, and wildlife and fish. This provision is particularly timely in view of increasing pressure from a fast-growing population and will grow in significance as the population gets bigger.

Trees planted: 2 billion.—For the second year approximately 2 billion trees were planted on

some 2 million acres throughout the country. About 88 percent of this was on privately owned lands. This is a commendable record. But compared with what needs to be planted, it falls considerably short.

Leading in plantings on private land were the larger industrial ownerships, which accounted for about a third of all private planting. For most classes of land, planting increased slightly over that of 1959—except in the class that needed it most, the small private woodland or family forest. In these ownerships there was a 12-percent decrease from 1959 plantings. Again this points up a major problem for the Nation: *the urgent need for an intensive forestry effort on small forest properties.*

Fifty years of forest product research was commemorated this year, marking the golden anniversary of the Forest Products Laboratory at Madison, Wis. This pioneering institution in wood research has made itself felt in many aspects of the American economy, and in the process gained a worldwide reputation. Through the years many foreign scientists have come to the Laboratory to learn, and returned home to start similar efforts in their own lands. The stream of visitors from abroad grows each year.

Modern research facilities.—It was perhaps fitting that this year which brought special recognition to a long-established laboratory should also see completion of the first stage of a large-scale, planned research building program. During 1960 Forest Service scientists moved into modern quarters in eight newly constructed laboratories widely spread from Florida to California.

Trees that grow faster, that are better suited to specific localities, and that resist insects and diseases were being scientifically bred at forest genetics institutes. Both chemical and biological controls against insects and diseases were improved. The raw material base for pulp and paper products was broadened by a new method of making newsprint and sulfite pulp from western woods. Through expanded use of the cold soda pulping process, more of the plentiful low-grade hardwoods were going into liners and other paper products. A long search to convert wood residues and waste to industrial chemicals had reached the pilot plant stage.

Forestry aid to other countries.—Here is an area in which the American people through their Government are making another contribution to less fortunate countries. It is done mainly by way of making forestry knowledge and training available to people from underdeveloped nations. This year the Forest Service assisted in training 332 people from 54 different countries who came here for various kinds of forestry study. These individuals return to their own countries and put the knowledge to work improving resources and thus the living conditions of their people.

Timber harvest at new high.—An alltime record 9.4 billion board feet of timber was cut from National Forests in fiscal 1960, up a billion board feet over the previous year. Now containing much of the old-growth sawtimber left in America, National Forests are being called on to supply more of the expanding wood needs. The 1960 harvest represented about 14 percent of the timber cut in the entire country.

More timber was sold from these public lands in 1960 than ever before: 12.2 billion board feet. This included 3 billion feet of pulpwood in Arizona and New Mexico which will bring a valuable new industry to that region; cutting the smaller trees will also thin and improve the rest of the forest.

Cash receipts: $148 million.—Timber and other resources of the National Forest System brought in $148 million for the year—a $24 million increase over 1959. This is in addition to the other enormous benefits which the public receives from these lands, such as recreation, water, hunting and fishing—all values not easily measured in dollars.

America's playgrounds.—With recreation use still climbing—92.5 million visits this year—National Forests have become "America's Playgrounds." No other land system on earth affords so many so much outdoor fun. The 1960 record is 13 percent higher than last year's. No end is in sight to this astounding surge into the wide open spaces.

National Grasslands established.—This new category of public land was made a part of the National Forest System in 1960. National Grasslands include 3.8 million acres in Western and Great Plains States. The land is mainly suitable for grassland agriculture, grazing, watershed protection, and outdoor recreation. Hunting and fishing opportunities are big assets, destined to grow in importance and popularity.

These lands are not newly acquired by the Federal Government. They have been in Federal ownership, known as land utilization projects, since the 1930's when they were purchased, many of them as wornout, dust-bowl areas. Since then an improvement program has brought them back to a more productive condition. As land utilization projects their future was somewhat uncertain. The change means that this large area of public land was placed in a more permanent status; that they are now to be given a long-range type of management similar to that for National Forests.

Cooperation—State and Private Forestry

Mr. B. and the Farm Forester

"I wouldn't sell a fencepost now without calling my forester," said Mr. B. This sums up one farmer's attitude toward a farm forester after being convinced that he and his woodlands could profit from professional forestry help. Mr. B.'s story illustrates one way cooperative Federal-State programs reach out into the landowner's woods to help him. The farm forester is employed by the State and paid in part by Forest Service cooperative funds.

Mr. B. owned 160 acres of land containing some fairly good timber. To send his daughter to college he decided to sell his timber, estimating that he could get $2,500 for it. With the advice of the farm forester, trees on a 140-acre tract were marked for sale, leaving the younger trees for future harvest. This resulted in an estimated volume of 114,000 board feet which sold on a sealed bid for $4,300. Mr. B. was amazed.

Later that year beetles attacked some of his trees because of careless logging. By recommending the spraying of infested trees, the forester helped him rid his forest of this threat.

Just before Christmas, Mr. B. decided to clear-cut a 15-acre swamp. Since the tract was somewhat rough, it was put up for sale without marking. But the highest offer was only $900 and was rejected. Mr. B. and a forester marked the timber, leaving only a seed tree stand. Their figures showed a marked volume of 62,000 board feet, 88 cords of pulpwood, and 30 cords of topwood. This sold on a sealed bid for $3,350.

So Mr. B. with professional forestry help has received $7,550 from his woodland in 2 years—woodland that he valued at $2,500. A pulpwood thinning is planned for next year. And he still has a growing, producing forest.

Mr. B. was also helped through the cooperative Federal-State forest fire prevention and control programs. These activities may have kept his woods from going up in smoke.

The blot on this neat picture is that across the United States there are far too many Mr. B.'s who are not doing what this one did. In all, there are more than 4 million owners of small woodlands who are not now making the most of their forests. Progress is being made, but compared to what needs to be done the progress is too slow.

During 1960, Federal-State cooperative programs authorized by Congress provided increased benefits to State and private forest landowners. Another State joined the cooperative forest fire control program and made possible the expansion of protection against forest fire. Under the Cooperative Forest Management Act program several thousand additional forest owners were given assistance in their management and marketing problems. Other cooperative programs that showed advances were pest control, watershed protection, flood prevention, and rural development. For the second year in succession, tree planting was above the 2 billion mark.

TREE PLANTING

Forest and shelterbelt tree planting throughout the United States exceeded 2 million acres in fiscal year 1960 for the second year in succession. Total acreage planted was 2,137,460, a decrease of 14,283 from 1959 plantings.

Of the planting nationwide, 88 percent was on privately owned lands, one-third of which was the property of forest or other industrial organizations. About 600,000 acres, or nearly half of the nonindustrial private land that was planted, was cropland placed in the Conservation Reserve program under 10-year contracts.

Forest planting by all classes of ownership increased substantially, except for the noncorporate private ownership group, or small woodland owners, which showed a decrease of 169,255 acres or 12 percent from last year.

Windbarrier planting of 35,366 acres was a 2,094-acre increase over 1959 and nearly 1,000 acres over 1958, the previous alltime high. More than one-third of this planting was done in North Dakota, where single-row planting has shown a big upsurge in the last 2 or 3 years.

Federal land planting totaled 173,486 acres. National Forest plantings amounted to 134,257 acres, an increase of 22,000 acres, which offset a major reduction in planting on other Federal land. Department of the Interior plantings amounted to 22,647 acres, and those on other Federal lands totaled 16,582 acres.

State and other non-Federal public land planting not only recovered from its slump in 1959 but surged ahead in 1960 with a total of 91,216 acres. This is substantially more than had been planted previously on this class of land.

Southeast in Planting Lead

The 11 Southeastern States planted 1,532,571 acres, or nearly 72 percent of the total for the

603783—61——2

Nation. Nine of these States planted over 50,000 acres each. Four States outside the Southeast planted more than 50,000 acres each: Oregon 120,597 acres, Washington 68,874, Michigan 53,953, and Wisconsin 52,104.

Direct Seeding Increases

Seeding with forest tree seeds increased materially in 1960, with a total area seeded of 164,523 in contrast to 108,766 acres in 1959 and 81,296 acres in 1958. Most of this seeding—98.6 percent, or all but 2,273 acres—was on public and industry-owned land. The use of this method of forestation has been made feasible by coating the seeds with bird- and rodent-repelling chemicals to prevent the seeds from being eaten before germination.

Seedlings Exceed Demand

In the past, shortage of planting stock frequently was a factor limiting tree plantings. This year there was an adequate supply of seedlings in most States, with an oversupply in a few States. A total of 1,918,746,000 trees was shipped to landowners and planters in 1960 compared with 2,080,122,000 in 1959. Deliveries from State nurseries suffered the greatest reduction—1,359,306,000 in 1960 as against 1,536,694,000 in 1959. Forest Service and industrial nurseries reported substantial increases in deliveries.

Tree Planting Stock (C–M 4)

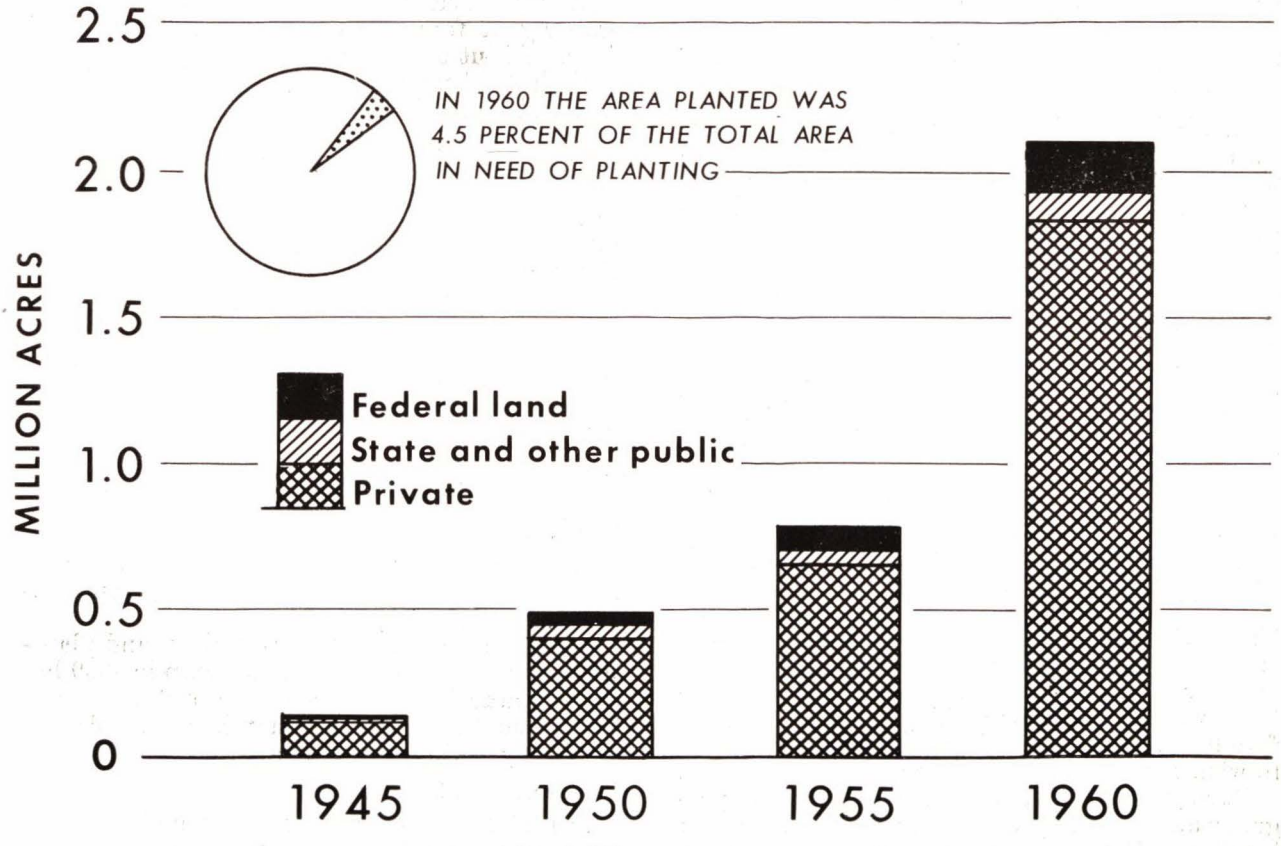
Distribution of trees acquired and produced under section 4 of the Clarke-McNary Act declined sharply in 1960—844,599,000 plants compared with 945,464,000 in 1959. Forty-eight States and Puerto Rico cooperated in this program.

Direct Federal financial assistance to this program was the smallest it had been since fiscal 1950: $185,988. The State contribution was the largest it ever had been: $2,201,446. Landowner or purchaser contribution amounted to $4,185,146, which is less than 1959 by $390,136.

To encourage tree planting, the price of planting stock is kept as low as possible. The average selling price in fiscal 1960 was $5.24 per thousand.

ACRES PLANTED AND SEEDED TO TREES

(Excluding Windbarrier Planting)



Conservation Reserve

Tree planting signup under the Conservation Reserve program, including 1960 contracts, amounted to 2,168,540 acres. This is a smaller acreage than that estimated early in the program, largely because appropriations were less than anticipated. Nearly 8 percent of all land withdrawn from agricultural production under Conservation Reserve contracts is being planted to trees. In the States of the Southern Region, exclusive of Oklahoma and Texas, 43.2 percent of the total signup is devoted to tree cover. These nine States have 85 percent of all of the tree-planting signup.

Conservation Reserve funds in fiscal 1960 enabled States to grow or buy up 522,830,000 seedlings for planting. State Foresters provided 1,250 man-months of technical assistance to landowners and county committees in the planting of Conservation Reserve lands. Approximately 72 percent of this service was financed by Conservation Reserve funds allotted to the States.

COOPERATIVE FIRE CONTROL

The cooperative forest fire control program now includes 48 States, Alaska having joined during the year. Nonparticipants are Arizona and Kansas. A study to determine the needs for cooperative forest fire protection in Arizona was recently completed and may result in the State joining the program. Under this program, authorized by the Clarke-McNary Act of 1924, the Forest Service cooperates with the States in protecting State and privately owned forest lands against fire.

The Federal Government contributed $9,401,000 in 1960 for protection of State and privately owned forest lands against fire. State and private expenditures were $47,240,000, or about 83 percent of the total. Total expenditures of $56,641,000 were some $2 million greater than for the previous year. This was made possible by the increased State and private contribution.

Program Records Studied

In 1959, the Association of State Foresters and the Forest Service completed a joint review of recordkeeping in the cooperative fire control program. This review, recommended by the Battelle Memorial Institute after a 2-year study, was made to collect more detailed and consistent data related to fire experience and costs as a basis for concise future evaluation of the program. Results of the review have been sent to all State Foresters, and the proposed changes are beginning to be made.

The Fire Record

In 1960, 3,855,823 acres of State and privately owned forest lands were burned by 91,297 forest fires. While the acreage burned represents an increase over last year's figure, it is better than might have been expected in view of the bad fire season throughout much of the West. Acreage burned and number of fires are still well below previous 5-year averages. The 1960 record demonstrates the value of protection: 77,537 fires on protected State and private land burned 1,908,704 acres, but only 13,700 fires on unprotected land burned a total of 1,947,121 acres—more than half the total acreage burned.

National Fire Protection Association

Forest Service representatives served on the Forest and Rural Protection Committees of the National Fire Protection Association. These committees have been active in developing and publishing information on standard practices for the prevention and control of fires on forest areas and rural properties.

Excess Federal Property Helps

The Forest Service assisted cooperating States in acquiring excess Federal equipment. Acquisition of this equipment was of material aid to the States, particularly those which had few funds for the cooperative forest fire control program.

COOPERATIVE FOREST FIRE PREVENTION

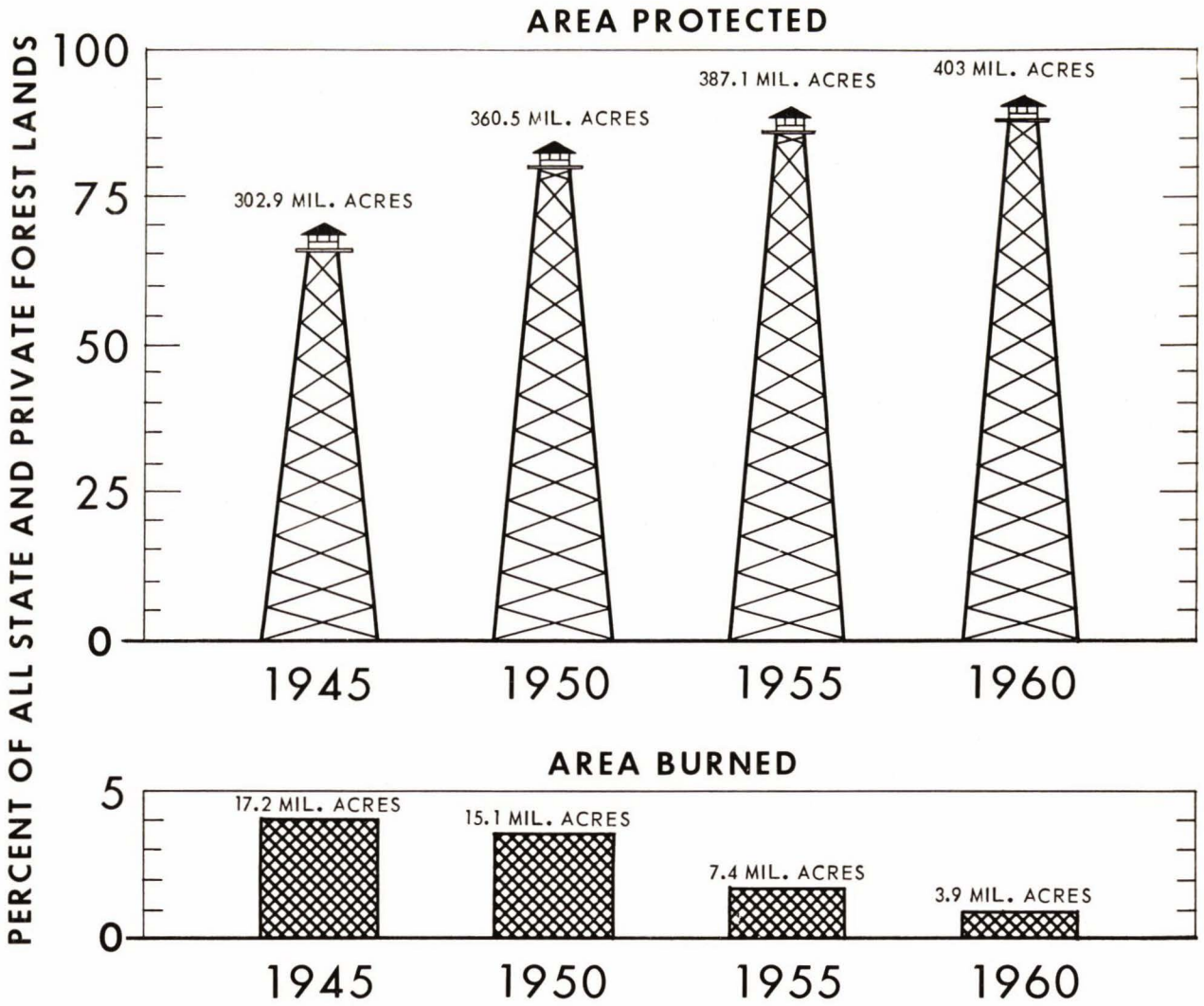
The nationwide Cooperative Forest Fire Prevention (CFFP) Campaign was again successful in keeping down the number of man-caused forest fires in 1960. For the fourth year in succession, man-caused forest fires were below 100,000 and the acreage burned by these fires was kept below 4 million acres. While this is a good record considering previous years, the area burned over would be comparable to a strip of country about 1½ miles wide stretching from Anchorage, Alaska, to Richmond, Va. Aside from the relatively low number of fires, 1960 was a bad forest fire year.

Golden Smokey Awards

Golden Smokey statuettes were awarded this year to three groups who have done outstanding work for forest fire prevention. One was presented to Foote, Cone & Belding, Inc., the advertising company which, free of charge, has planned and promoted for 20 consecutive years high-level advertising for the cooperative forest fire prevention program. Estimating this contribution at $50,000 a year, in 20 years Foote, Cone & Belding have donated a million dollars' worth of time and talent to forest fire prevention.

Another award was presented to the Post Office Department for its fine cooperation in the program. The third award was made to the newspapers of America. Statuettes went to the following three groups as best representing newspaper cooperation—the National Editorial Association, the Newspaper Advertising Executives Association, and the American Publishers Association.

FIRE PROTECTION ON STATE AND PRIVATE FOREST LANDS



Southern CFFP Advancing

The Southern Cooperative Forest Fire Prevention program continued to be effective in the 11 Southern States. This program, primarily for adults, is aimed at preventing maliciously set forest fires. The program's symbol, Mr. Burnit, is a despicable rascal, with his two eyes on one side of his face. The television spot "Mr. Burnit's Eyes" brings home to Southerners the damage caused by incendiary forest fires to resources of the South.

Other CFFP Activities

The booklet "Smokey's Story of the Forest" has been distributed to 6 million youngsters. It is required reading in many schools. To date, 3,600,000 youngsters have enrolled as Junior Forest Rangers. Smokey's mail—mostly requests for Junior Forest Ranger Kits—averages 500,000 letters and cards each year.

Over the past 12 years, 1,140,000 copies of "You and Forest Fires" and 1,350,000 copies of "Forest

and Flame in the Bible" have been printed and distributed by popular demand.

Each year over 20 million pieces of printed fire prevention material are distributed. Over 3 million Smokey comic books and some 2 million Golden Books and related commercial items have been sold and distributed. These little envoys of forest fire prevention have brought in $200,000 in royalty funds to be spent for furthering forest fire prevention.

FOREST MANAGEMENT

Participating in the Cooperative Forest Management Act Program in fiscal 1960 were 46 States and Puerto Rico. Congress appropriated $1,542,000 and the cooperating States spent $2,484,411. The only States not now participating are Alaska, Arizona, Wyoming, and Hawaii.

A total of 82,188 owners were assisted with management and marketing problems on more than 4 million acres of small woodlands by 531 State-employed foresters. Services to these owners included preparation of plans for timber production and other special products such as naval stores; and help in marking timber for sale, in tree planting, in protection from fire, grazing, and pests, and in increasing wildlife and recreation benefits.

Assistance was given to woodland owners and operators in marketing 596 million board feet of timber products having a gross value of $14,082,709. Advice on improved methods of logging and mill layout and operation was furnished to 8,099 small operators and processors.

Technical Training

Specialized technical forestry instruction was provided for public and private agencies, forest industries, colleges, universities, and large forest landowners. The Forest Service participated in or helped conduct training schools for State, Federal, industrial, and consulting foresters on the latest techniques of management, utilization, log grading, and continuous forest inventory.

Naval Stores Program

The Forest Service cooperated with the Agricultural Conservation Program Service in the Naval Stores Conservation Program. About 2,500 gum naval stores producers, or two-thirds of the total number, participated in the program. Participating purchasers worked about 90 percent of the entire naval stores crop.

FORESTRY AND RURAL DEVELOPMENT

Forestry continued to play a major role in helping depressed rural communities get on their feet economically. About 220 counties are active in the organized Rural Areas Development Program. Over half the area of these counties is commercial forest land. In about four-fifths of the Rural Areas Development counties, forest landowners and processors of primary forest products are provided with technical forestry assistance through Federal-State cooperative work.

How forest resources could bolster rural job opportunities was reemphasized in Forest Service activities. Working with State forestry agencies and the Extension Service, the Forest Service assisted State and county committees in planning the full use of their forest resources. The success of this work with local people and industry is evidenced by the increase in numbers of wood-using industries either located in or drawing raw material from rural areas.

PEST CONTROL

A constant battle goes on to keep forest diseases and insects under control. These silent and often unseen enemies do more damage to forests in the long run than does fire. The Forest Service makes surveys to detect and evaluate outbreaks of destructive insects and diseases, controls pests on National Forests, participates in cooperative Federal and non-Federal cost-sharing control programs, and furnishes technical assistance to other Federal agencies in their control projects.

Antibiotics Kill Blister Rust

The successful use of antibiotic fungicides in controlling blister rust in western white pine is a major breakthrough in the long fight against this destructive disease. Rapid expansion of this method is foreseen in the Western and North Central States where control by eradication of ribes (gooseberry and currant bushes) is costly and far from complete as contrasted with the Eastern States where control is maintained by previously established ribes eradication.

Overall, the Forest Service continued its blister rust control on public and private land by (1) conducting control programs on 31 National Forests, (2) providing technical direction to blister rust control activities by the Department of the Interior on 7 National Parks and 3 Indian Reservations, and (3) cooperating on Federal-State share-the-cost control work on State and private land in 22 States.

As now practiced, blister rust control is accomplished by two methods. One, the older preventive method, is the slow and hard-work way of removing ribes from pine stands, since the disease must spend part of its life cycle on ribes before it can infect white pine.

The newer method is the curing of infected trees by spraying antibiotic fungicides in oil and/or water carriers onto the bark or foliage of the tree. The antibiotics are absorbed through the bark or needles and translocated sufficiently to kill the fungus. If the drugs can be successfully applied as an aerial spray, which seems likely now,

control will be simplified and greatly accelerated on large areas.

Both methods were used in 1960. Ribes were removed from 224,141 acres, and surveys were made of 2,121,000 acres to determine the need and timing of ribes eradication for effectiveness and quality of control. Antibiotic fungicide use as a full-scale control measure was confined to the western white pine type in Idaho, Montana, Oregon, and Washington. In these States 8.5 million trees on 45,000 acres were treated. In addition, surveys were made over about 3 million acres to determine where antibiotic treatment is feasible and justified.

Oak Wilt Control

The Forest Service participated in Federal-State share-the-cost projects to control the oak wilt disease on private land in Arkansas, Kentucky, North Carolina, Pennsylvania, Virginia, and West Virginia. Control work was also done on five National Forests in these same States. Systematic aerial surveys of about 40 million acres of State and private land resulted in the detection of 5,409 infected trees, which were treated by State-employed crews. On 3.8 million acres of National Forest land covered by aerial detection surveys, 186 infected trees were found and treated. More oak-wilt-infected trees were found and treated in 1960 than in any previous year. Project supervisors attribute the increase to better and more intense aerial survey coverage.

Dwarfmistletoe

Control of dwarfmistletoe, a parasitic disease of conifers, was confined during the year to (1) surveys of National Forests in California to facilitate control through timber sales, (2) pilot control tests on National Forests in Oregon to establish costs needed in an economic study, and (3) a small control project in a National Forest in Colorado. Some 110,000 acres were surveyed and 5,919 trees treated.

Controlling Destructive Insects

In administering the Forest Pest Control Act (Public Law 110), the Forest Service carried out or took part in 184 separate control projects in 27 States. Control work was done on 80 National Forests and Federal assistance was given on 6 projects on non-Federal lands.

Suppression activities were directed against a variety of destructive forest insects, including 16 species of bark beetles, 6 defoliators, and 7 other insects such as weevils, aphids, spittlebugs, and cone and seed insects. Again this year, the largest share of available funds was necessarily spent on bark-beetle control. At a cost of over $1.7 million, more than 1 million infested trees, stumps, and cull logs were chemically treated. The largest single project was in Utah, where more than $719,000 was spent in a continuing battle to suppress a widespread outbreak of mountain pine beetle on the Wasatch National Forest.

Aerial spraying to control defoliating insects was mostly against the spruce budworm. The largest project was in Maine where Federal funds were used cooperatively on a cost-sharing project of 217,000 acres. On a budworm project in Montana, two different dosages of DDT were used. Along streams, one-half pound of DDT per gallon per acre was used to avoid any adverse side effects on fish; on the remaining areas the usual 1 pound of DDT per gallon per acre was used. The reduced dosage sufficiently penetrated thin forest cover along streams; results show satisfactory mortality with no reported fish losses.

During the year a study was made to determine feasibility of aerial spraying to control the blackheaded budworm, a potentially destructive outbreak of which is developing in southeastern Alaska. The study showed that operational problems can be met and that under rugged Alaska conditions aerial spraying is possible. However, because of the known detrimental effects of DDT insecticides on salmon, aerial spraying in Alaska cannot be considered until an acceptable insecticide has been found that will kill the budworm but will not seriously damage fish.

FLOOD PREVENTION

Prevention Projects Continued

The Forest Service continued work on seven flood prevention projects authorized under the Flood Control Act of 1944. During fiscal 1960, 52 million trees were planted on 42,889 acres of eroding and flood-producing lands. Most of these trees were planted on the Little Tallahatchie River and Yazoo River projects in Mississippi through the combined efforts of the Forest Service, Soil Conservation Service, Agricultural Conservation Program Service, Agricultural Extension Service, Conservation Reserve, and local farmers.

Technical forestry assistance was provided to 3,577 landowners and operators. Improved forest management was extended to 45,328 acres of privately owned land; 17 miles of sediment-producing logging roads on private land were stabilized. Fire prevention and control were strengthened on about 90,000 acres of National Forest land through the construction of 16 miles of firebreaks and by providing additional physical facilities, including mobile equipment, buildings to house fire protection personnel, and radio installations. Ten debris basins were constructed, 2 miles of stream channel stabilized, and erosion control measures were applied to 9 miles of mountain roads.

Pilot Projects Near Completion

The Watershed Demonstration or pilot program on 58 small watersheds, authorized in 1954, is nearing completion. Almost all of the forestry

measures planned for National Forest and non-Federal forest lands have been accomplished.

In fiscal 1960 the Forest Service, State foresters, Soil Conservation Service, and local project sponsors worked together on 16 pilot projects. Approximately 1.3 million trees were planted on 952 acres. Technical forestry assistance was given 124 landowners. Improved forest management was effected on 1,454 acres.

Local Communities Aided

In cooperation with the Soil Conservation Service, the Forest Service helps local organizations plan and carry out Watershed Protection and Flood Prevention programs under Public Law 566 (83d Cong.).

Under this program, work was carried on with State foresters, Soil Conservation Service, and local sponsors in planning improvements for 302 small watersheds. Plans were approved and installations authorized on 77 new projects; 42 of these include accelerated programs for improving forest lands.

The work included planting 3.6 million trees on 3,285 acres of privately owned land and giving technical forestry aid to 798 landowners. In addition, protection from forest fire was extended or strengthened on 372,439 acres. Other watershed work on 23,450 acres included timber-stand improvement and protection from grazing.

On National Forest lands, installed improvements included revegetation of 2,143 acres of depleted watershed land; erosion control on 52 miles of roads and trails; special-purpose terraces and contour furrowing on 573 acres of critical flood and sediment source areas; stabilization of 21 miles of eroding gullies; 62 miles of fencing for watershed protection; and the structural improvement of 2½ miles of mountain stream channels.

Treatments To Prevent Floods

Emergency watershed treatment measures were applied on 11 burned-over areas of National Forest land to minimize potential hazards to life and property. These areas are distributed by States as follows: Arizona, 2; California, 6; and Idaho, Oregon, and South Dakota, 1 each. About 43,310 acres were aerially seeded to quick-growing grass and mustard. Fills and roadbanks on 20 miles of Forest Service roads were given emergency treatment to prevent accelerated movement of road material into stream channels.

Aiding River Basin Studies

Cooperative assistance to the Southeast and Texas River Basins U.S. Study Commissions was continued. Through joint efforts of the Forest Service and the State forester, a report concerning forest lands and forest industries of the Texas River Basins was completed and submitted to the Texas U.S. Study Commission. Under contractual arrangements with the Southeast Basins U.S. Study Commission, the Forest Service continued preparation of reports concerning forest stands, forest industries, projections of forest growth, future supplies, and needs for forest-land resources.

At the request of the Commission this information is being compiled by subdivisions of the study area. At the close of 1960 three reports had been submitted to the Commission and additional studies were nearing completion. Other cooperative assistance to both Commissions included technical consultation, review of report material, and the furnishing of forestry data already compiled.

In cooperation with the Corps of Engineers, similar studies of the Potomac River Basin were continued. At the end of the year, field studies had been completed and most of the related reports drafted.

The Forest Service continued to take part in the USDA reappraisal of projects authorized by the Upper Colorado Storage Act. Reports on the forestry impacts of three participating projects were completed, studies of two additional projects were continued, and study of a sixth was begun.

River basin studies of water and related land resources made cooperatively by the Soil Conservation Service, Agricultural Research Service, Forest Service, and the States concerned were continued on the Tombigbee River in Alabama and Mississippi, the Deschutes and Upper Willamette Rivers in Oregon, the Humboldt River in Nevada, and Bayou Bartholomew in Louisiana and Arkansas. During the year a similar study was initiated on the Sevier River in Utah and preliminary arrangements were completed for like studies of the Gunnison River in Colorado and two minor river basins in Oregon.

Forest Service membership was provided on interagency river basin technical subcommittees for hydrology, sedimentation, phreatophyte control and recreation.

Forestry Research

During the past year the research program of the Forest Service was substantially strengthened with the completion of several new laboratories. For the first time a major construction program to give scientists the space, equipment, and other facilities essential to their work has been accomplished through funds provided by Congress specifically for that purpose. Individual laboratories, each housing a fully operational program with increased emphasis on basic research, are located as follows:

Missoula, Mont.—Forest fire research.

Rhinelander, Wis.—Forest genetics research for northern species.

Grand Rapids, Minn.—Research in the silviculture and water problems of Northern Lake States forests.

Rapid City, S. Dak.—Research in the silviculture and related problems of ponderosa pine in the Black Hills.

Lake City, Fla.—Research in naval stores and the silviculture of longleaf and slash pine.

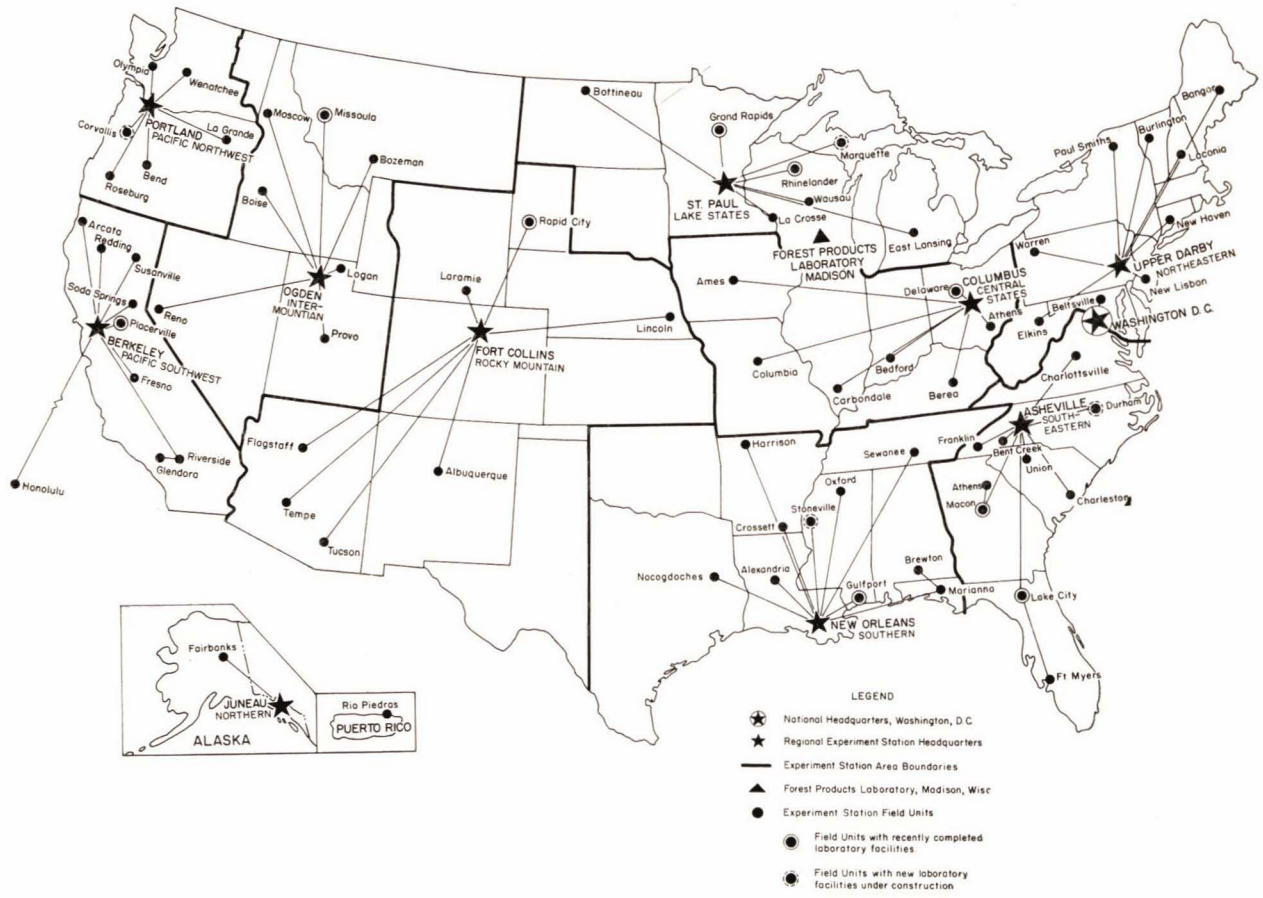
Gulfport, Miss.—Forest genetics research for southern species.

Delaware, Ohio.—Forest insect and disease research for central hardwood forest species and coniferous plantations.

Placerville, Calif.—Forest genetics research for western species.

The following are examples of progress made in 1960 toward a better knowledge and understanding of the many aspects of forest land use and forest products utilization.

FOREST SERVICE RESEARCH



FOREST MANAGEMENT RESEARCH

Breeding Superior Trees

Controlled breeding studies in Idaho have shown that as much as 21 percent of the variation of growth rate in young trees is related to the growth rate of the parents. Thus it would be possible to increase the growth of future forests by selecting the best seed trees. This would be in addition to any increase that might be induced by silvicultural practices such as thinning. Another example of progress in tree improvement is found in a hybrid of slash and shortleaf pine planted in Arkansas. Already proven to be resistant to fusiform rust, this hybrid has been growing 50 percent faster than the parent shortleaf pine, and in addition recovers better from tipmoth attack than either shortleaf or loblolly pines.

Growth and Yield of Pine Plantations

A comprehensive growth study of slash pine plantations has been completed in the middle Coastal Plain of the Southeast. This research has provided a series of site index curves, cubic-foot volume tables, cubic-foot yields, and wood-weight yields of plantations by spacing and by site productivity classes. These are essential tools in the big job of managing slash pine plantations.

Sand Pine Problem Solved

A 5-year study to find out how to regenerate sand pine in central Florida has been successfully completed; the details are given in the Department's Production Research Report No. 30. Previously, foresters have been unable to duplicate, under conditions of fire protection, the fine young stands which nature had produced following destructive wildfires. To find the solution it was first necessary to learn requirements for seed production and germination and seedling survival of this valuable but little-known timber species. Then forestry practices had to be worked out that would meet these requirements. Research men found that clear cutting mature stands in summer and fall, followed by mechanical scarification of the ground, and then lopping and scattering cone-bearing branches and tops of harvested trees, usually gave satisfactory natural regeneration.

Tree Nutrition, Light, and Mycorrhizae

Mycorrhizae are minute, complex structures formed in the soil by a coupling of tree roots and certain fungi. For the scientific management of forests we must understand more fully the nature and functions of these structures. It has been known for some time that they influence the growth of some tree species by improving the availability of nutrients. Now a study with seedlings of Virginia, loblolly, and white pines has demonstrated that there are also interrelationships of light and soil fertility to mycorrhizal development. Best development occurred in full sunlight under natural daylength and in unamended sandy loam soil. The adverse effects of a high level of nutrition on mycorrhizae must be considered when planning the addition of fertilizer to stimulate the growth of tree seedlings.

Site Quality vs. Tree Quality

Thousands of acres of second-growth yellow-poplar are reaching merchantable size every year in the southeastern United States. These stands need thinning for sawtimber at about 50 years of age, but Appalachian timber buyers haven't had a real knowledge of what this young sawtimber is worth. In four studies designed to supply this information, the Southeastern Station found that existing hardwood log and tree grades give workable estimates of lumber values for young yellow-poplar, but that for a given tree grade, the proportion of high-grade lumber is considerably higher on a good site than on a poor site.

New Trees for Old

The distance to which a clear-cut area will be restocked by bordering stands varies considerably with species, size of seed crop, location, wind direction, and local conditions. Studies in Alaska show that western hemlock will not reproduce satisfactorily beyond a quarter mile except with a high wind or a heavy seed crop. Western larch in Montana will reproduce to a distance of about a quarter mile in good seed years but not much over 250 feet in poor seed years. Sugar maple and yellow birch in the Upper Peninsula of Michigan will reproduce to a distance of about 330 feet during good seed years. This and similar information on seed dissemination make possible a planned cutting that will avoid creating openings too large to restock naturally.

Managing Mature Western White Pine

The Northern Rocky Mountain region contains an abundance of mature and overmature stands which require some form of light, partial cutting if they are to be brought under management reasonably soon. Research has developed a system of tree vigor classification which is now being used as a sound basis for making light cuttings in mature western white pine. These light, partial cuttings on a vigor selection basis offer real possibilities: (1) to anticipate mortality and salvage potential losses, (2) to improve vigor and beetle resistance of forest stands, (3) to improve average tree growth, (4) to open stands to intensive management, and (5) to aid in blister rust control through ribes suppression.

FOREST FIRE RESEARCH

More and more of our forested areas are being brought under the protection of highly organized fire control agencies using the best available equipment and firefighting methods. In spite of this,

603733—61——3

forest fires continue to start and burn in numbers inconsistent with present-day protection goals, and to demonstrate their ability at times to overpower the best of firefighting methods. It seems that, especially in some of our better protected regions, we have come as far as practicable under present-day understanding and methods. Yet the growing demands upon our forest resources call for new and higher levels of protection from fire.

Fire research is aimed at supplying better methods, practices, and techniques to meet this need. It is devoted both to meeting immediate needs of fire control agencies, and to an increased understanding of the more fundamental aspects of fire and forest relationships.

Forest Fire Prevention

Most fires in the United States are still man caused and therefore "preventable." To discover the shortest and most direct route to stopping forest fires before they start, we are attempting to learn more about attitudes, awareness, and fire prevention knowledge among various groups of forest users in the West.

Preliminary results from a cooperative study with the University of Southern California show us that many fire law violators in California are well aware of the importance of fire prevention, but very poorly informed about fire laws. For example: 40 percent of the people interviewed did not know that burning permits are required for trash burning as well as for burning off brushland.

Results from these preliminary surveys indicate that while mass media campaigns have apparently been very successful in arousing a desire to prevent forest fires, they have done very little to increase "how-to-do-it" information on the part of the readers, listeners, and viewers. Correct, specific, prevention information seems to come mostly from individual contacts. With more knowledge about the weaknesses as well as the more productive phases of present fire prevention methods, we will be in a position to strengthen total effort by redirecting and refocusing certain phases of the overall prevention program.

Chemicals in Forest Fire Control

Chemical retardants continue to be of major interest to forest fire control agencies. Past research efforts with retardants have resulted in the ever-growing use of sodium calcium borate and of bentonite clay throughout the United States, especially in aerial attack on forest fires. Research into firefighting chemicals is being directed both at discovery of cheaper or more effective materials, and at ways to improve the effectiveness of borate and bentonite.

Recent tests show that solutions of diammonium phosphate, a common and relatively cheap fertilizer, offer good promise of being effective fire retardants in light fuels. This material would have an added advantage of not harming treated vegetation which escaped damage from the fire. Experiments with chemical additives have shown how to improve the retardant qualities of borate and bentonite slurries by decreasing the evaporation of water, by building up the water-holding capacity, and by increasing the viscosity or stickiness of the solution.

Effects of Forest Fire

Accurate evaluation of fire damage to a forest stand is essential not only to meaningful "bookkeeping" in protection administration but also to intelligent planning of salvage operations and rehabilitation measures. Underlying the problem of damage evaluation are many questions of a basic nature pertaining to plant physiology and the mechanics of heat transfer. Research into the thermal characteristics of tree bark, along with observations of living plant tissue exposed to heat, has resulted in new knowledge upon which to build some methods of evaluating effects of wildfire on a forest stand. Thermal conductivity, specific heat, and equilibrium moisture contents have been determined for several pine species to account for differences between species in the insulating value of bark. Experimentation with a "hotstage" microscope has revealed that plant cells are permanently damaged at much lower temperatures than previously thought.

WATERSHED MANAGEMENT

Experimental Forest Watersheds Burn

On July 20, 1960, fire destroyed nearly all plant cover on the San Dimas Experimental Forest in southern California, along with watershed research installations and experiments. Although this loss was great, it was immediately turned into an opportunity to study methods of rehabilitating burned areas and to determine the effect on water yields and fire hazard of controlling patterns of vegetation regrowth.

Emergency watershed stabilization measures were first established: 14,000 acres were reseeded; channel structures were designed and built; and laboratory and field plot studies using a number of soil-binding chemicals were installed. Watershed instrumentation and other research facilities were reestablished so climatic and streamflow records could be continued and the effectiveness of management measures evaluated. A system of experimental permanent-grass fuel breaks was established, to be evaluated for their effectiveness in reducing hazard from large fires and for increasing water yields. Twenty-five small watersheds have been established for comparing soil stabilization and flood and erosion reduction measures. Cooperative aid from agencies of Los Angeles County and the State of California has been outstanding.

Management Controls Sediment

With increasing application of multiple use on forest and related lands, problems of maintaining or improving soil stability on slopes and streambanks become more acute. Sediment in streams as a result of logging, grazing, roadbuilding, and other uses of the land is a problem in both East and West.

In West Virginia, the amount of sediment released in the stream of a small watershed was only slightly increased by carefully planned skidroads and intensive selection logging, but was increased by more than 3,000 times with unplanned skidroads and commercial clear cutting. On the Gallatin Elk Range in Montana moderate-intensity rainstorms produced less than 50 pounds of erosion per acre where the surface soil was porous and light in density, and ground cover (vegetation plus litter) covered 70 percent or more of the surface area. With progressively heavier textured soils and less ground cover, the amount of soil eroded increased steeply.

Following a record of mud-rock floods, sedimentation has been virtually eliminated from Parrish Creek in Utah, after 22 years of protection from grazing plus contour trenching and reseeding. Total annual streamflow has decreased by 2.70 area-inches, 83 percent of which occurred in the first 11 years after treatment. In addition, the maximum daily discharge came later in the spring, prolonging flows into the dry season.

Improved Water Yields

Manipulation of forest and other vegetation cover provides a promise for increasing water yields through management. In the fourth year following alternate strip cutting which removed the trees from 40 percent of a 714-acre subalpine watershed in Colorado, water yields showed an increase of 3.1 area-inches or 183 acre-feet. Increases of 4.2 area-inches were recorded in 1956, 3.4 inches in 1957, and 2.1 inches in 1958, and indicate that the cutting effects are lasting.

In east-central California the removal of brush in the process of converting brushfields to pine forest resulted in an estimated annual saving of 5 area-inches of water. Spraying of brush and forb cover on 40 acres of deep soils in a 100-acre watershed in southern California reduced evapotranspiration losses by 5.6 acre-feet, while on another area clearing of 40 acres of woodland riparian vegetation in an 875-acre watershed increased streamflow yield by 38 acre-feet over a 17-month period.

Trees Use Water—Reduce Floods

One important effect of forests in flood control comes about through their use of water stored in the soil so that larger amounts of water can be reabsorbed before excessive surface flow begins from heavy rainfall. In the first growing season after clear cutting a forest area in southern Ohio, soil moisture depletion of a soil having a retention capacity of 13 inches of water was only 3.4 inches as compared to 6.6 inches under uncut forest. In the second year, soil moisture depletion was 4.8 inches under clearcut, but 7.1 inches where the forest was uncut, an average difference of 2.75 inches of water for the 2 years. This greater capacity of the soils under the uncut forest to take up water could have significant effect in reducing flood flows should heavy rains occur during fall or winter seasons.

FOREST INSECTS

Biological Control

During the past year several experiments have yielded new knowledge on how to use natural biological factors to prevent serious damage by forest insects. Disease-causing organisms are one means of control that shows considerable promise. This is a method of introducing a disease that kills the insect. For example, a species of fungus has been isolated from the western pine beetle, and a species of *Penicillium* from the Engelmann spruce beetle. *Bacillus thuringiensis*, an organism known to be effective against many different insects, was also isolated from these two bark beetles.

Substantial progress has been made toward learning how to use this last disease in actual control. Laboratory studies have shown that spruce budworm larvae can be killed within 2½ days after being fed Douglas-fir foliage that had been sprayed with an extract made from *Bacillus thuringiensis*. In small-scale field studies practically all budworm larvae that had fed on treated Douglas-fir foliage also died within 5 days. Research to determine the possibilities of using this material in large-scale control programs is continuing.

Already proven by research to be effective and practical is a virus spray to control European pine sawfly in red pine plantations. Now further experimentation has shown that the virus can be held in storage for at least 5 years prior to application without loss in effectiveness.

Another type of biological control is that achieved with use of insect predators. In 1960 research efforts to secure biological control of the balsam woolly aphid in fir forests of the Pacific Northwest, the Northeast, and the Southern Appalachians were expanded; arrangements were made through the so-called PL–480 program for entomologists in India and Pakistan to survey aphid-infested stands in those countries for promising predators, and to ship such predators to this country. During the past 4 years, large numbers of several species of predators have been introduced from Europe. A few of these are known to have survived for 2 or more years, but it is too early to evaluate their control effectiveness.

Other Control Developments

Experiments in Mississippi have shown that by dipping cottonwood cuttings for one-half their

length in Thimet-carbon dust prior to planting, attacks by the cottonwood borer, two leaf beetles, and a species of root and stem borer were prevented for 6 months. During this period the cuttings grew to a height of 12 to 14 feet.

Recent studies have shown that Engelmann spruce beetle infestations in stands at high elevations in the Rocky Mountains can be detected and evaluated from a helicopter. The capacity of a helicopter to fly slowly and at low levels above treetops permits observers to detect infestations that are too small to be detected from fixed-wing aircraft. This system is now being used on several National Forests.

In California, new experimental evidence has confirmed results obtained in earlier studies which indicated that a lindane-in-oil spray was effective in bark beetle control. In field tests, mortality of the western pine beetle emerging from sprayed logs was 92 percent. In another test against the California five-spined Ips beetle, mortality was 100 percent in sprayed logs.

Progress is being made in studies to determine the resistance of various wire insulation materials to termite attack. Sheets of polyethylene exposed continuously to heavy termite infestations remained almost free of damage for at least 8 years. Coal-tar-pitch-impregnated fiber conduit also offers promise, some test samples having remained free of attack for 13 years under similar conditions.

FOREST DISEASES

Research on forest diseases is concerned with preventing deterioration of wood in use as well as protecting the living tree from seedling to maturity. In both areas we have two broad, but related goals: (1) To develop direct controls for immediate application, and (2) to understand fully the basic factors causing disease buildup and spread so that effective long-term preventive measures can be developed. The following are examples of significant advances made during the year.

"Soft-Rot" Fungi in Wood Products

It has been learned that so-called soft rot is much more common and destructive than previously realized. Furthermore, it has now been determined that fungi causing soft rot differ in several essential ways from those causing typical white and brown rots. The existence and exact nature of these differences, such as tolerance to high temperature and moisture conditions, and to several commonly used wood preservatives, had to be understood before satisfactory progress could be made in preventing soft-rot losses. This knowledge also enables us to explain and anticipate the special prevalence of soft-rot fungi in cooling towers, below-ground parts of transmission poles, and other wooden structures exposed to high moisture environments.

Possible Recovery of Export Market

A laboratory method of sterilizing by chemical fumigation oak bolts infected by the oak wilt fungus has been developed. This provides a promising direct approach to control of one aspect of this disease. Industrial application of these findings could lead to recovery of export markets now closed as a result of foreign embargoes on imports of oak logs from the United States of America because of the oak wilt hazard.

Knowledge of Littleleaf Complete

One of the most destructive maladies of shortleaf pine is a root disease known as littleleaf. While the cause of the disease—a soil-inhabiting fungus, *Phytophthora cinnamomi*, parasitic on the fine feeding roots—has been known for some years, effective control has been blocked by lack of knowledge as to why trees were killed on some sites but remained relatively unaffected on others. Now, after 20 years of complicated and difficult research, the explanation has finally and literally been "unearthed." Normally, the attacked tree can regenerate the damaged roots faster than they are killed. But in poorly aerated and poorly drained soils, adequate root growth is inhibited and the tree gradually declines and eventually dies, essentially of starvation. Trees now growing on such "littleleaf sites" must be harvested at an early age, and future management calls for conversion of these areas to forests composed of less susceptible species.

RANGE MANAGEMENT AND WILDLIFE HABITAT

Seeded Areas Provide Firebreaks

In Louisiana, K31 fescue, bahia and Bermuda grasses and lespedeza survived satisfactorily under heavily grazed conditions on seeded areas and remained in suitable condition to serve as forage firebreaks. The seeded species survived better on grazed than on ungrazed areas because of greater competition from native species on the latter. These forage firebreaks are less likely to erode than burned or plowed strips, and grazing values compensate for loss of timber production on the breaks.

Rest-Rotation Grazing Effective in Drought

Rest-rotation management is a system of alternating range grazing use and nonuse based on growth requirements of major forage species. It has been under a practical test on a native perennial bunchgrass range on the Lassen National Forest in California for 8 years. In 1959, one of the driest years of record, the system had a severe trial. With only 9.58 inches of precipitation during the year where the longtime average is 18 inches, cattle weight gains were satisfactory and vegetative condition apparently improved on some parts of the range.

Revegetating Depleted Big-Game Ranges

Both small plots and pilot operations have given encouraging answers to the problem of increasing forage for game and livestock on deteriorated juniper-pinyon areas in Utah. Observations over the past 4 years on 225 species and strains of shrubs and forbs show at least 30 will be useful for improving the quality and quantity of the forage. A natural hybrid of bitterbrush and cliffrose appears especially promising. It retains the wide adaptability of bitterbrush and the evergreen habit of cliffrose. Fourwing saltbush also shows important and useful adaptation to foothill areas in Utah. It possesses the unique and desired characteristics of making its most prolific growth when much of the other vegetation is drying up.

Grazing Damage Reduced

In Louisiana, copper carbonate in asphalt emulsion was the most effective of several repellents in an experiment designed to reduce cattle grazing damage to planted slash pine seedlings. About half of the treated seedlings escaped damage on an open range with a high concentration of cattle, whereas more than 90 percent of the untreated seedlings were dead or heavily browsed. All seedlings treated with copper carbonate were damaged to some extent by the chemical, but those planted within 7 days of the treatment grew and survived as well as the untreated.

FOREST RECREATION RESEARCH

The forest recreation research program was strengthened appreciably in the Northeast and California, and was extended to the Pacific Northwest, the Lake States, and the Southeast. Many studies are underway to help the forest administrator meet problems of ever-increasing recreational use. A major need of the forest recreation manager is for more reliable knowledge about the wants, needs, attitudes, and numbers of recreationists. Two studies are underway to fill this need: one on the Boundary Waters Canoe Area in Minnesota, and the other on National Forests in Pennsylvania and West Virginia.

FOREST ECONOMICS

Progress on Forest Survey

Forest inventories conducted in 14 States during the past year covered more than 70 million acres of forest land to determine the area, volume, and quality of forest resources, rates of timber growth and depletion, and other resource information basic to public and private forestry programs. Except for portions of Alaska, most of the 775 million acres of forest in the Nation has now been inventoried at least once. Some 40 publications on forest resources and industries in newly surveyed States were issued during the year.

More Pine, Less Hardwood in Arkansas

As an example of Forest Survey findings, a report on the third survey of Arkansas shows a 30-percent increase in the volume of softwood timber and nearly a 10-percent decrease in hardwood volume during the 9 years since the previous survey. The area of forest lands increased 7 percent during the 9 years between surveys, largely as a result of reversion of abandoned farm lands to forest.

The increase in softwood volumes was attributed mainly to improved fire protection, conservative timber harvesting, and stand improvement measures to replace low-quality hardwoods with pine on upland areas. Clearing of bottom lands for agriculture was the primary reason for a decrease in hardwood volumes. Except for large hardwoods, annual timber growth in Arkansas exceeds the annual cut by a comfortable margin. Timber from Arkansas forests now supports more than 1,000 sawmills and other primary wood-using plants.

Photointerpretation Handbook

One result of a continuing program of survey techniques research was development of a training handbook outlining basic procedures for aerial photointerpretation and measurements. This manual, based on experience gained over a number of years, outlines methods for using aerial photographs in various types of forest inventories and includes a kit of photographs, problems, and photogrammetric aids.

Economic Guides for Forest Protection

Forest economic studies completed during the year resulted in the development of detailed guides for appraising profitability of blister rust control with alternative management measures in white pine stands in the Lake States. The report on this study also indicates the relative profitability of rust control opportunities in various sections of the Lake States region and provides a basis for allotting available rust control funds to areas that will return the greatest benefits from such investments.

As part of a similar study initiated in the Northeast, procedures were developed to determine white pine volume losses caused by weevil injury in individual stands. Analysis of volume loss in relation to tree size and to number and position of weevil injuries provided a formula for estimating the physical and economic losses that can be expected from weevil attack in particular white pine stands.

Saw Logs Scaled by Weight

Studies on "scaling" southern pine saw logs by weight showed that lumber yields can be more closely estimated by weighing logs than by scaling with conventional log rules. Weighing logs by truckloads promises substantial saving in time and money and a more equitable basis for purchase and sale of logs than now exists in many areas.

FOREST PRODUCTS UTILIZATION

FPL's Golden Anniversary

The Golden Anniversary of the founding of the Forest Products Laboratory at Madison, Wis., was celebrated on June 4, 1960. On that date in 1910 its doors were officially opened as a cooperative effort with the University of Wisconsin. Some 5,000 anniversary guests and visitors, including forest industry leaders, educators, scientists, and government administrators, reviewed the past achievements of the world's first wood research laboratory and discussed guideposts for the future. A number of industry association awards were presented to the Laboratory in recognition of outstanding contributions, along with the Distinguished Service Award of the Department of Agriculture.

Wood Density Surveys

One of the urgent industry needs from the standpoint of more effective utilization of wood is the development of sound data on average density and its range of variation within species, and the magnitude of difference between species. In softwoods, particularly, such data can provide a basis for evaluating strength characteristics, pulp yields, and other properties related to the use of wood for lumber, plywood, poles and piling, pulp, and other large markets.

Density surveys in Mississippi have been completed and published. Fieldwork in Florida, Missouri, and Arkansas is essentially complete. Work in Georgia is in progress. Extensive studies are now also underway in Western States at the request of industry. While these studies are highly complex and will take years to complete, they will provide valuable information that has long been lacking.

Chemical Wood Seasoning

Research at the Forest Products Laboratory on the use of a chemical (polyethylene glycol-1000) for dimensional stabilization and improved drying of wood has progressed to the point where its advantages are being utilized commercially. With the new chemical treatment methods and ultradrastic kiln schedules, it is possible to start with green walnut and produce a superior (dimensionally stable) kiln dry rifle stock in only 30 days, as compared with the 90 to 120 days the industry normally takes just to dry a gunstock blank by conventional practices. The same chemical can also be used to prevent degrade during seasoning of such valuable items as wood carvings.

Adhesive Symposium

During the year a symposium on adhesives for the wood industry, sponsored jointly by the Forest Products Laboratory and the Products and Research Committee of the National Lumber Manufacturers' Association, was held at the Laboratory. More than 100 top research and production men from all parts of the United States participated. The conference, designed to stimulate thinking on possible new approaches to wood-bonding problems, was judged highly successful by the participants. Eleven specific recommendations will aid in directing current and future research in the most productive channels. It is expected that conferences such as this symposium will be held at regular intervals to provide a basis for periodic reevaluation of goals in this fast-moving aspect of forest products utilization.

Wood Pole Study

An extensive study of wood poles carried on at the Forest Products Laboratory over the past 6 years in cooperation with the American Society for Testing Materials culminated in the issuance of a final report by the ASTM late in the year. Included were full-scale tests of some 620 poles from 25 to 55 feet long and about 14,000 tests of matched small, clear specimens. By far the most comprehensive pole studies ever undertaken, the results provide information that will contribute to more efficient use of wood in the future.

FOREIGN FORESTRY SERVICES

During the year there were increased demands for cooperative services in the foreign forestry field, both from the International Cooperation Administration (ICA), under a contractual arrangement with the Department, and from international organizations of which the United States is a member. Services performed for ICA in cooperation with the Foreign Agricultural Service of the Department continued to be divided largely between the training of foreign nationals and so-called technical consultation and support.

Training Foreign Nationals

The Foreign Training Unit prepared or participated in the preparation of 143 training programs and study tours for 332 foreign nationals from 54 countries. Of these programs, 106 were for individuals and 37 for teams of from 2 to 23 persons. Included were three annual short courses in Tropical Forestry, Forest Management, and Arid Range Management.

Ninety-one programs were sponsored by ICA; five by the Food and Agriculture Organization of the United Nations (FAO); and the remainder by other international organizations, foreign governments, or in a few cases by the individuals themselves. Many visitors in this third category were those who came to the United States to attend the Fifth World Forestry Congress and for whom additional study tours were prepared (other than official Congress tours).

The programs provided for training in a wide variety of subjects; 36 were in forest management, 25 in forest products utilization, 18 in watershed management (or related soil and water conserva-

tion), 17 in general forestry, 11 in forest economics (including forest survey techniques), 10 in range management, 10 in forest engineering, 4 in forest protection, and 12 in administrative management. The programs in administrative management were primarily for nonforesters who came to the United States to study public administration. Programs in general forestry were usually for high-ranking forestry personnel in administrative or supervisory positions.

A notable increase occurred in the number of participants scheduled to attend colleges and universities for academic training in forestry or related curriculums. At the beginning of the fall term, 45 were registered at various institutions. Of these, 8 were taking work leading to the bachelor and 14 to the master of forestry degrees; the remainder were classed as special nondegree students.

Considerable progress was made in concentrating primary training centers for foreign nationals in the Forest Service at fewer locations to provide more effective on-the-job training and observational study. Progress was also made in compiling for the various primary training centers (1) the subject matter and activities in which training can be most effectively given, (2) the proper length of the training period, and (3) the best season of the year for such training.

Technical Consultation and Support

This unit received an increased number of requests, mainly from ICA, for technical "backstopping" information required by U.S. Operations Mission (USOM) foresters and industry specialists overseas. More than 150 such requests came from USOM's and other sources in 50 countries, covering a wide range of subject matter but with increasing weight on utilization and forest-industry matters. Many of those concerning forest products were referred to the Forest Products Laboratory for the desired information. In general, backstopping requests require the collaboration of one or more Forest Service divisions in providing the specialized information called for.

Other services to ICA included supervising procurement of forest-survey and other specialized forestry equipment, and of tree seeds, cuttings, and other plant materials for several USOM's; consultations with 15 ICA foresters on technical matters pertaining to their work, prior to assignment or during home leave; recruitment of foresters for 8 regular-term (2-year) and 7 short-term assignments overseas; arranging for preparation of a bulletin on wood seasoning for the ICA Office of Industry Resources; and the systematic distribution of selected technical forestry publications to ICA foresters abroad.

International Organization Activities

In the field of international organization affairs, the office of Foreign Forestry Services assisted in making arrangements for Forest Service participation in international conferences, preparing position papers, and responding to requests for information from international agencies. It assisted in preparations and conduct of the Fifth World Forestry Congress, the outstanding forestry event of 1960.

Of approximately 600 foreign visitors registered as Congress members, 60 attended as a part of the foreign training programs prepared and carried out by the Forest Service and other agencies under ICA and FAO sponsorship. In addition, individual tours were arranged for 25 high-ranking foreign forestry officials to visit Forest Service field centers, and films and tape recordings of interviews with about 40 such officials were arranged for use in programs of the U.S. Information Agency, Voice of America, and other communication media.

Foreign Forestry Services also helped in making plans for the first session, in 1961, of the newly created North American Forestry Commission, under FAO, to be composed of Mexico, Canada, and the United States. The Commission will provide an effective medium for dealing with forestry matters of regional interest, in part through committees which will work on problems of mutual interest in specialized fields. There are similar FAO regional forestry commissions for Europe, Latin America, Asia and the Pacific, the Near East, and Africa.

National Forest Resource Management

Three things stand out in National Forest resource management for 1960. These were passage of the multiple use-sustained yield law, establishment of the National Grasslands, and the beginning of the long-range development effort—the Program for the National Forests.

The Multiple Use-Sustained Yield Law

On June 12, 1960, the President signed into law the National Forest Multiple Use-Sustained Yield Act. It is a major milestone in the long history of the National Forests. (A complete copy of the law will be found under "Program Planning and Legislation," p. 34.)

Though brief—it can be read in less than a minute—this act has far-reaching consequences. It does these things: (1) Gives legislative recognition of multiple use and sustained yield principles of management; (2) provides a clear-cut directive to apply these principles on the National Forests; and (3) names the basic renewable surface resources for which the National Forests are established and administered and assures their equal consideration under law.

The law states "That it is the policy of the Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes."

National Forests have been administered for many years under the dual conservation policies of multiple use and sustained yield. There has been no question as to the authority of the Forest Service to manage National Forests under these policies. This authority, however, has been merely permissive. The new act gives a statutory directive to manage these public lands for multiple use and sustained yield. The Forest Service no longer *may*, but *must* so manage them.

Moreover, this directive applies to all the renewable surface resources. Management of these other resources has been authorized through various legislative enactments extending back over many years. But nowhere were all of these major resources named in a single statute. Nor was coordinated management of all these resources clearly defined. Similarly, there had not previously been specific legislative recognition that these resources shall be managed for sustained yield.

With the ever-growing value of National Forest resources and their increased use and accessibility, the pressures for single use of large areas are increasing tremendously. This statutory recognition of multiple use and sustained yield management will help materially to prevent possible future overuse of one resource or impairment of land productivity resulting from economic pressure or pressures of single-interest groups.

The act spells out definitions of multiple use and sustained yield. Since the general directive is to manage these lands so that they best meet the needs of the American people, the act and the accompanying legislative reports require that the five basic renewable resources shall be utilized in the combination that will best serve all the people.

The lengthy deliberations by Congress, the testimony of many individuals and representatives of National Forest user groups, the legislative history, the widespread discussion of this legislative proposal—all these have, and will continue to have, a profound influence in helping many people to think more clearly of what multiple use and sustained yield actually mean. Unquestionably, this law is a valuable contribution to American forestry.

National Grasslands

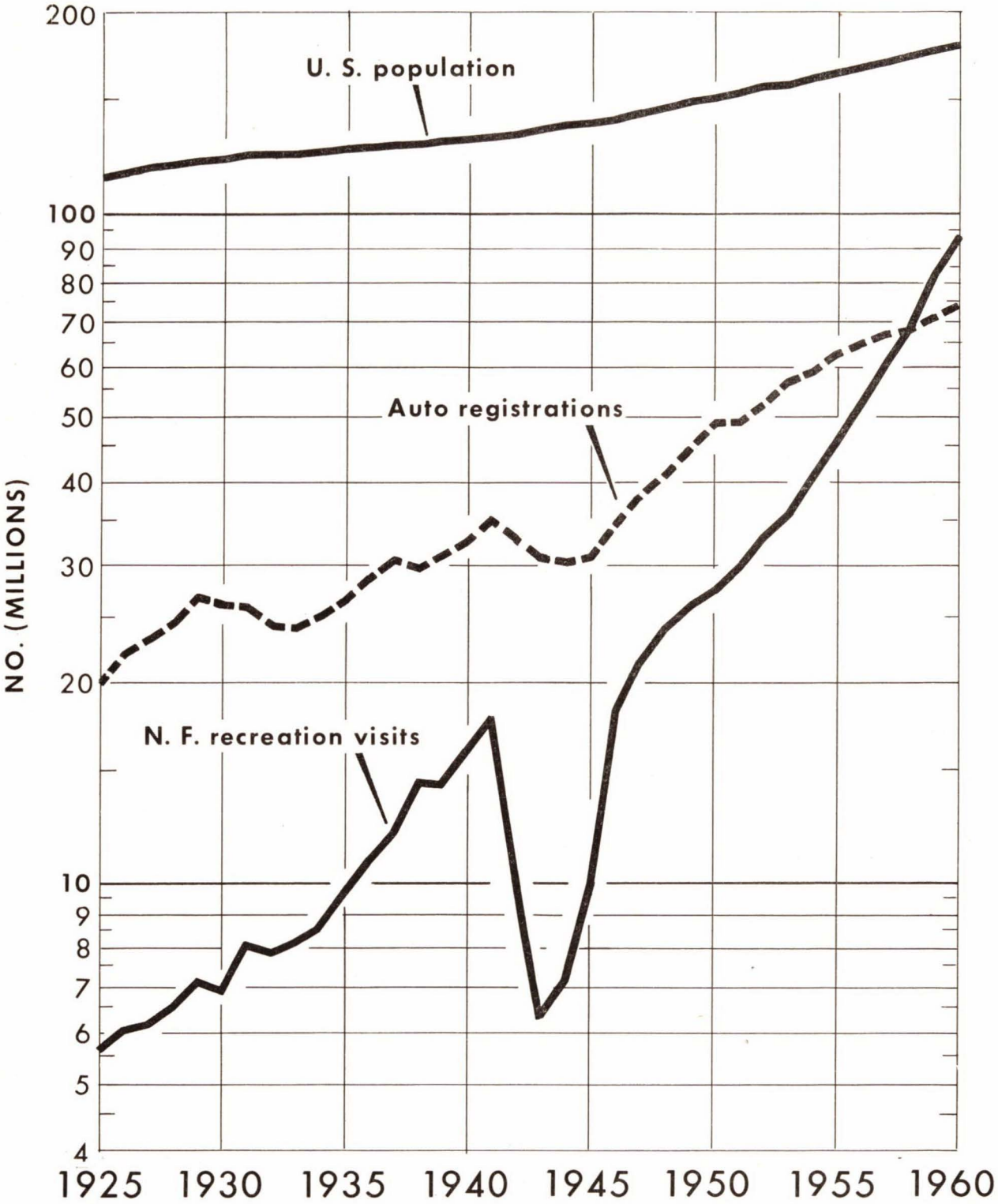
The 18 National Grasslands include nearly 4 million (3,822,000) acres in parts of 11 Great Plains and Western States. Under an Administrative Order of the Secretary of Agriculture, these former Land Utilization Projects became part of the National Forest System to be administered under title III of the Bankhead-Jones Farm Tenant Act. They are being managed for outdoor recreation, range, timber, watershed, and wildlife and fish purposes under multiple use and sustained yield principles. Additional details will be found under "Lands," page 28.

Program for the National Forests

This broad-scale action plan, often called Operation Multiple Use, got underway during the year. Although the proposal was submitted to Congress

COMPARATIVE INCREASES

In U. S. Population, National Forest Recreation Visits and Motor Vehicle Registration



603733—61——4

in 1959, the first funds to begin it—approximately $30 million—were in the budget for fiscal 1961, which began July 1, 1960.

The impact of the program is being felt in all National Forest activities. It is being activated through more intense and detailed management plans for all the resources furnished by these public lands—the water, recreation, range, timber, and wildlife. All activities out on the forests have been affected; apparent is a heightened sense of urgency toward making these forests serve to their fullest capacity the needs and wishes of the American people. This is the goal of National Forest management. This is the work that Operation Multiple Use has begun to achieve.

AMERICA'S PLAYGROUNDS

National Forests are fast becoming the major outdoor playgrounds for the Nation, with recreation still the fastest growing use. Again a record number of visits were made to these public forests during the year—92.5 million. This was a climb upward of 11 million visits, or 13 percent above those for 1959. Visits averaged more than a day each for a total of 101.7 million man-days' use.

The 1960 upsurge was only typical of recent annual increases: 19 percent in 1959, 12 percent in 1958, 16 percent in 1957, and so on. Under Operation Outdoors existing facilities are maintained and rehabilitated and new ones built. But the demand outgrows the improvements; more will have to be done to meet anticipated increases in recreation visitors.

National Forest recreation comes in many forms: Picnicking, fishing, hunting, camping, skiing, swimming, hiking, riding, or just the quiet enjoyment of forest and wilderness scenery. Every one of these recreation uses is increasing; recreation visits have more than tripled since 1950.

Growth of National Forest recreation can be seen in this comparison of figures showing primary purpose of visits in recent years:

Primary Purpose:	*1960*	*1959*	*1956*	*1950*
General enjoyment of the forest environment	30, 181, 000	23, 538, 000	14, 190, 000	7, 969, 000
Picknicking	19, 497, 000	19, 296, 000	12, 821, 000	6, 326, 000
Fishing	14, 534, 000	13, 301, 000	9, 499, 000	4, 885, 000
Hunting	7, 591, 000	6, 838, 000	4, 436, 000	2, 285, 000
Camping	6, 597, 000	5, 681, 000	3, 516, 000	1, 534, 000
Winter sports	4, 499, 000	3, 986, 000	2, 673, 000	1, 517, 000
Swimming	2, 801, 000	2, 520, 000	1, 610, 000	902, 000
Hiking and riding	2, 018, 000	1, 786, 000	1, 353, 000	635, 000
Organization camping, canoeing, scientific study, hobbies, wilderness, etc	4, 876, 000	4, 575, 000	2, 458, 000	1, 315, 000
Total	92, 594, 000	81, 521, 000	52, 556, 000	27, 368, 000

Call of the Wilderness

Two areas were added and two reclassified in the National Forest wilderness system. This system now includes 83 established wilderness, wild, and primitive areas, including the Boundary Waters Canoe Area, devoted to preserving wilderness environment for its unique and irreplaceable value. These areas total 14,661,416 acres.

The areas added were the Glacier Peak Wilderness Area in the Mount Baker and Wenatchee National Forests in Washington State, and the Wheeler Peak Wild Area in the Carson National Forest in New Mexico. The Glacier Peak Wilderness Area contains 458,505 acres of rugged mountains, glaciers, streams, and lakes, and heavily timbered deep valley floors. Wheeler Peak Wild Area (6,051 acres) includes the highest point in New Mexico, Wheeler Peak (elevation 13,160 feet), and some of the State's most outstanding scenery.

The San Jacinto Primitive Area in the San Bernardino National Forest, Calif., was reclassified as a wild area in January. It consists of 21,955 acres of level flats, high country, and precipitous cliffs above Palm Springs.

In August the Bridger Primitive Area was reclassified to wilderness status. This new wilderness area contains 383,300 acres of high mountain country along the Green and Wind River Ranges in the Bridger National Forest, Wyo.

Madison Canyon Earthquake Area

The Madison Canyon Earthquake Area was officially dedicated August 17, 1960, the first anniversary of the violent earthquake that shook southwestern Montana in the vicinity of Hebgen Lake. The earthquake blocked the Madison River with a huge rockslide, created a 7-mile lake, left faults up to 20 feet in height, and took the lives of about 20 people. At the dedication a bronze plaque was unveiled in memory of those who died.

Shortly after the earthquake the Forest Service established this special area under regulation U–3 to protect and make more accessible the major geological features that remain as evidence of the earthquake. Plans have been and are being implemented for tourist facilities, new trails, a new campground, and interpretive signs and exhibits. Under Forest Service management the new area, covering 38,000 acres in the Gallatin and Beaverhead National Forests, will remain a center of interest for scientists, students, and tourists; over 100,000 people have already visited the area since the earthquake.

Progress on Operation Outdoors

Operation Outdoors, Part I, is now in its fourth year. The 5-year program is designed to pro-

vide sanitation, cleanup, and care for existing recreation sites, and to provide new sites and facilities to relieve overcrowding and to take care of expected increases by 1962.

In 3½ years, Operation Outdoors has accomplished the following toward reaching its 5-year goals. Existing sites and facilities have been adequately maintained. Of the 40,175 family camp and picnic units scheduled for rehabilitation, work has been completed on more than 13,000. Of the 40,500 new family camp and picnic units called for in the program, 11,000 have been constructed.

While these accomplishments mean progress, public demand has grown faster than expected. Financing and installation of new facilities has not kept pace with demand. Estimates in 1955 predicted 66 million visits by 1962; by 1958, recreation visits had already exceeded the estimate, and 1960's 92.5 million visits topped the original estimate by 26.5 million. A later estimate predicts 100 million visits by 1962. Operation Outdoors will not meet its goal unless the program is stepped up considerably or its period extended.

National Forest Recreation Survey

In 1959 the Forest Service initiated a detailed 2-year survey of recreation resources on the 185 million acres within the National Forests and National Grasslands. Object of the National Forest Recreation Survey is to determine the adequacy of existing and potential National Forest recreation resources to meet anticipated needs for the years 1976 and 2000. The survey will be used to evaluate existing policy and to formulate future policies and programs. It will be the basis for regional and forest recreation management plans within the framework of multiple use policies and the "Program for the National Forests."

As a part of the survey the Forest Service has made a projection of future recreation pressures; this indicates an expected 230 million recreation visits to the National Forests by 1976 and probably over 600 million by the year 2000. Fieldwork for the survey was completed in 1960, and the data are now being compiled, analyzed, and evaluated. The final report should be completed by early 1962.

SPECIAL USES

The Forest Service issues permits for more than 100 different kinds of special use on the National Forests. Special use permits are held by individuals, companies, or agencies for such purposes as telephone line rights-of-way, cabins, churches, resorts, schools, winter sports areas, and landing fields. As of June 30, 1960, more than 58,000 permits were in effect for 3.5 million acres.

Besides their commercial and utilitarian value, special use facilities provide for public and private enjoyment of the National Forests. The more than 500 resorts, 154 winter sports areas, and 19,000 summer homes make an important contribution to National Forest recreation; they supplement the many types of free recreational use: Camping, picnicking, hiking, riding, mountain climbing, and scenic and esthetic enjoyment.

No charge is made for permits involving public use, and for many types of organizational use only nominal fees are required. Those obtaining permits for commercial or private use must pay a fee commensurate with the value of such use. Total land use receipts for fiscal year 1960 were $1,520,397. Recreation uses, including commercial public service facilities and recreation residences, accounted for $1,100,435; power permits brought in $80,959; and other land uses accounted for $339,003. These receipts represent an increase of $69,855 over fiscal year 1959.

In addition, approximately 2,100 oil, gas, and other mineral leases and permits were in effect on 1,666,540 acres of acquired National Forest land. Receipts from leases and permits in effect during fiscal year 1960 totaled $1,259,848 as against $1,138,110 for fiscal year 1959.

Land Use Legislation

Two acts of Congress had a specific effect on use of National Forest lands and materials:

(1) Act of July 7, 1960 (74 Stat. 363), amended the Communications Act of 1934 with respect to certain rebroadcasting activities and provided the necessary authority for the Federal Communications Commission to establish rules and regulations authorizing operation of low-power translator stations. Subject to those rules and regulations the way was open for the Forest Service to issue land use permits for VHF translator stations enabling "landlocked" communities to receive television programs through these rebroadcast facilities. New stations were authorized and old stations which had operated without permission were given land use permits upon conformity with Federal Communications Commission regulations. Enactment of this legislation ended an impasse of several years over land use authorization and licensing for these stations.

(2) Act of June 11, 1960, authorized the Secretary of Agriculture to dispose of common varieties of mineral materials on acquired lands to the same extent and in the same manner that he had previously been authorized to dispose of such materials on National Forest and other land under his jurisdiction reserved from the public domain (multiple use mining law, July 23, 1955). This brings under the Secretary complete authority to dispose of common varieties of mineral materials on all land under Forest Service jurisdiction. The disposal policy is contained in 36 CFR 251.4, as amended September 22, 1960 (25 Fed. Reg. 9245). Public service will be greatly facilitated in this field by combining the disposal authority in the Department having jurisdiction over the lands.

Mining—Surface Rights

Determination of surface rights on mining claims under the multiple use mining law moves ahead rapidly. At the end of 1960, field examination had been completed on 689 areas totaling 96,506,763 acres. This represents completion of approximately 75 percent of the approved work to be done. There have been 16,752 mining claims included in verified statements; these constitute only about 2½ percent of the estimated claims on areas covered.

Surface rights procedure has been completed on 264 areas, totaling 34,202,367 acres, containing an estimated 277,032 mining claims. A total of 3,073 claims was included on verified statements, of which 2,580 claims were withdrawn by the claimants and 70 claims not upheld at hearings before a Bureau of Land Management hearing examiner. For 423 claims the Forest Service stipulated that the asserted surface rights were valid.

RANGE MANAGEMENT

The 64 million acres of rangeland on National Forests, National Grasslands, and Land Utilization Projects help some 21,000 farmers and ranchers to round out their yearlong livestock operations. Grazing under paid permit on National Forest land is particularly important in the West, where many ranch operators base their capital investment on the use of these lands for part of their annual operations.

During calendar year 1960, 1,140,429 cattle and 2,523,138 sheep grazed under permit on the National Forests, and 166,362 cattle and 51,209 sheep grazed on the National Grasslands and Land Utilization Projects administered by the Forest Service. An additional 3 million calves and lambs under 6 months of age grazed free of charge and were not included in the above figures. Receipts from grazing permits in fiscal year 1960 totaled $4,507,200, of which $1,126,800 was returned to the counties in which the rangelands are located.

Analyzing Range Allotment

The program of initial range allotment analysis progressed steadily during the year. Servicewide guidelines were completed and issued, and an equivalent of 543 range allotments was analyzed. At the end of fiscal year 1960 the range allotment analysis was one-third complete; initial analysis has been finished and plans prepared on 1,919 of the 11,292 National Forest and National Grassland allotments.

Range Improvements

Range revegetation work in fiscal year 1960 improved grazing conditions on 271,860 acres of National Forest rangeland—an increase of 122,745 acres over fiscal year 1959 work. In addition, 18,092 acres of National Grasslands were improved by range revegetation measures. The 798 miles of fence and 419 water developments constructed during the year will facilitate livestock management and encourage more evenly distributed grazing.

Information gathered from functional inspections and other sources clearly indicates that management of National Forest and National Grassland ranges is improving and becoming more intense. Many accomplishments are the result of cooperative action taken by forest officers and livestock operators; these actions in many cases were stimulated by facts obtained from the range allotment analysis program. Various systems of deferred and rest-rotation grazing have improved range conditions in many areas. Many National Forests in the West have established demonstration range allotments in cooperation with permittees to show improved systems of range management; improved range conditions on such areas have been instrumental in getting other permittees to practice improved management on adjacent National Forest ranges.

THE TIMBER RESOURCE

National Forest timber operations reflected intensified development and strong planning for the future. The most significant features of the year's operations were record volumes of timber cut and sold, greatly increased nursery production and reforestation, and new or revised management plans for an increased number of working circles.

Inventories and Management Plans

The goal is to revise timber management plans for National Forest working circles on an average 10-year cycle. In 1960 new timber management plans or major plan revisions were approved for 36 working circles out of a total of 410; this almost reaches the desired revision rate of 10 percent of the working circles each year. This objective should be fully attained by 1961.

The new working circle plans raised the area of commercial timber production by 456,000 acres and the allowable annual cut by 347 million board feet. This increased area and allowable cut is substantial progress toward the eventual harvest of the full sustained yield on every working circle. Development of working circle plans naturally include full attention to all other forest resources under multiple use management.

Reforestation and Timber Stand Improvement

The 13 Forest Service nurseries produced and shipped 137 million seedlings and transplants in 1960, an increase of 11 percent over 1959. First steps have been taken to establish four additional nurseries—two in Idaho and one each in California and Colorado; these will help the western National Forests to fulfill their expanding reforestation programs.

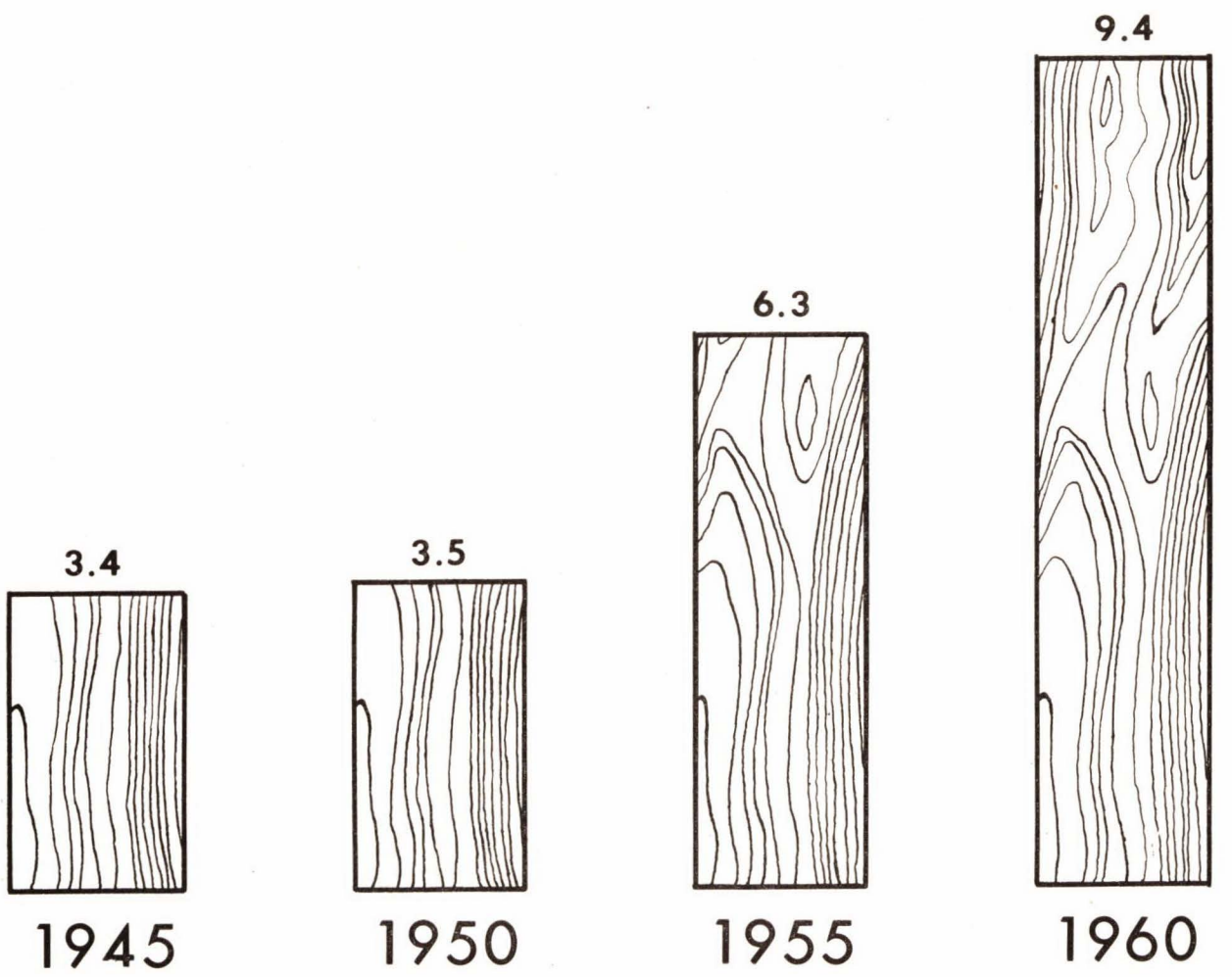
Major reforestation and stand improvement accomplishments in fiscal year 1960 were as follows:

Activity	Area treated from— Appropriated funds (acres)	Sale-area betterment funds (acres)	Total (acres)
Planting and seeding	43, 036	91, 221	134, 257
Natural regeneration measures	12, 938	25, 892	38, 830
Plantation release	32, 427	14, 423	46, 850
Natural release, weeding and thinning	14, 356	436, 718	451, 074
Pruning	2, 151	76, 482	78, 633
Animal control	15, 518	132, 695	148, 213
Rodent control	314, 227	13, 934	328, 161
Sanitation cutting and disease control	30, 205	32, 385	62, 590

Total acreage planted and seeded in 1960 was 20 percent greater than in 1959. Of the 134,000 acres reforested, nearly 18,000 acres were regenerated by direct seeding—37 percent more seeding than in 1959.

Timber Cut and Sold

National Forest timber harvest reached an all-time high in fiscal year 1960—a cut of 9.4 billion board feet, 1.1 billion board feet, or 13 percent, above that of 1959. Timber operations brought in cash receipts of $139.9 million, an increase of $24.7 million over fiscal year 1959. In the last 10 years National Forest timber cut has increased 2.7 times and the cash receipts 4.6 times.



Timber sales rose to a record 12.2 billion board feet in fiscal year 1960, or 2.8 billion board feet over fiscal year 1959. Receipts from these sales are not reflected until the timber is actually cut. A sale of 318 million board feet of overage lodgepole pine and Engelmann spruce was made on the Targhee National Forest. In addition to allowing for more intensive forestry, it should help broaden the employment and tax base in that part of southeastern Idaho. Conditions of the sale provide for reforestation, stand improvement, fire protection, and protection of watershed, scenic, and recreation areas.

Timber Valuation

Publication of the timber appraisal section of the Forest Service Handbook met a longstanding need for statements of policy and procedures in that area of National Forest administration. Following publication in May 1960, the regions held training meetings on timber appraisal policy, procedures, and techniques. In view of the great demand for National Forest timber, the Handbook section will be invaluable in helping Forest Service personnel determine fair market value of National Forest timber.

WATERSHED MANAGEMENT

Water is a priceless resource; no life survives without it. Our National Forests guard some of the best, and in some areas the only water-producing lands. The Forest Service protects, manages, and improves these valuable watersheds; it works continuously to assure that National Forest waters will meet the needs of the future.

Most National Forest lands have excellent vegetative cover; such a cover protects the soil and enables it to absorb easily the water that falls upon it. But more work must be done before protection is complete. Extreme abuse in the past or recent fires have left some areas in need of corrective measures, for Nature alone cannot always reestablish protective cover or repair heavy erosion damage. Prompt rehabilitation by the Forest Service restores these damaged areas to their rightful place as productive forest lands.

Rehabilitation was particularly needed for areas burned during the heavy fire years of 1959 and 1960—288,600 and 421,000 acres, respectively. Many of the burned areas were potential flood sources. An increased fiscal year 1961 budget for rehabilitation of burns made it possible to treat over 70,000 acres of denuded land and to restore or stabilize about 150 miles of roads and stream channels. The work included grass seeding, tree planting and seeding, contour terracing, snag removal, and construction of water diversions, gully plugs, debris dams, and trash racks. Restoration work for many of the 1960 burns has been accomplished or is now in progress.

Improving Watersheds

In addition to the emergency restoration of potential flood sources, the Forest Service cut into a backlog of planned rehabilitation projects on more than 100 National Forests. Typical of these projects were restoration work on the Casa Vieja Meadow on the Kern Plateau in California; seeding to grass and installation of gully plugs, sediment basins, and terraces on depleted lands in Taos Canyon, N. Mex.; installation of contour trenches and gully plugs, and the seeding of eroded land on the Sheep Creek project in Colorado; and work to reduce sediment being dumped into the Pallisades Reservoir on the West Fork of Elk Creek in Idaho. The Sheep Creek project also included needed maintenance on old Civilian Conservation Corps structures to prolong their usefulness.

Rehabilitation projects also include stream channel clearing and improvements. The objective of the project on Clear Creek in the Cherokee National Forest is to stabilize the channel and remove debris and sediment. Following a large fire in 1952, roads and bridges were heavily damaged when the channel became choked with debris and subject to frequent shifting at high water periods. In New Hampshire, pilot channel work got underway on the Zealand River to repair damage done by the October 1959 storm.

Sand dune stabilization was the objective of projects in Oregon and Lower Michigan. The Oregon project included the planting of 114 acres to beachgrass as a first step in restoration, and the planting of another 114 acres with scotch broom and pine as a second step (after initial establishment of the beachgrass). In lowland areas 130 acres were planted with barley, fescue, and clover for soil stabilization and game food. The Lower Michigan project combined beachgrass planting on 30 acres of scattered sand blows with red pine reforestation on 500 acres.

Forest Soils Program

The forest soils program was expanded in all regions except Alaska, and in Alaska preliminary work is underway. The western regions held a series of soils training schools for administrative officers at all levels. At the same time, a soils handbook was written, tested, and revised, and is now in final draft for publication.

Erosion, Water, and Resource Management

On several major projects and many sample watersheds, the Forest Service continues to gather information on various land uses as they affect water yield and erosion rates. The Beaver Creek project on the Coconino National Forest in Arizona will determine the effects of pine stand modification, juniper control, and clear cutting on watershed conditions. Improvements on the project include new access roads and the installation

of 15 weirs to measure water during periods of low flow.

In other areas, simple gaging stations were extended on sample watersheds of the Apache, Fishlake, Payette, Toiyabe, and San Isabel National Forests; they will furnish information to guide rangers in future land use and watershed studies. About 40 crest gages were installed on the Bitterroot and Flathead National Forests for use in gathering preliminary streamflow data.

THE WILDLIFE RESOURCE

The National Forests and National Grasslands provide food, water, and cover for a wide variety of fish and wildlife. About one-third of the country's big-game animals, one-fourth of its wild turkeys, and untold millions of small animals and birds—game and nongame—live on National Forest land. Every National Forest is the home for one or more species of big game, and almost all of the National Forest administrative units support huntable populations of small-game animals and upland game birds.

Every National Forest and National Grassland is open to the public for hunting and fishing, and the public looks more and more to the National Forests for enjoyment of these activities. In the last 10 years, use of the National Forests by hunters and fishermen has increased about 200 percent:

Sportsman visits to National Forests

	1950 (number)	*1960 (number)*
Hunters	2, 285, 000	7, 591, 000
Fishermen	4, 885, 000	14, 535, 000
Total	7, 170, 000	22, 126, 000

Hunters bagged 659,000 big-game animals and 10,000 turkeys on the National Forests and National Grasslands in 1960. This harvest represents nearly one-third of the big game and one-tenth of the wild turkeys taken in the entire country; it is also an increase of 70,000 big game and 3,000 turkeys over the 1959 harvest on National Forest lands.

Cooperation With States

The Forest Service continues to work closely with State fish and game departments to meet the growing public use of wildlife resources on the National Forests. In fiscal year 1960 the States and the Forest Service improved the fish and wildlife habitat on 53,500 acres of National Forest land and 53 miles of fishing streams; they constructed 308 small water developments, 1,980 acres of new fishing lakes, and 75 wildlife study enclosures. They jointly maintained existing wildlife habitat improvements on 164,400 acres of National Forest land, 154 miles of fishing streams, 896 small water developments, 1,690 acres of man-made lakes, and 340 study enclosures. These cooperative habitat developments include wildlife openings, food and cover plantings, water developments, browse regeneration, stream improvement structures, bank stabilization, new fishing lakes, and access roads and trails. This is but a small part of the total habitat improvement work that could be accomplished if the Forest Service wildlife activity were more adequately financed.

A new statewide cooperative agreement was completed with Texas during 1960.

Training Intensified

All regions, as well as the Washington office, conducted formal wildlife habitat management training courses for forest wildlife staff specialists. These specialists, in turn, conducted on-the-ground training for resource management personnel on their own forests. Interregional field training schools for range-wildlife staff specialists on coordinated game-livestock range analysis were held in Regions 5 and 9 during the spring and summer of 1960. Selected timber management and wildlife management specialists from each region participated in a servicewide field training school in timber management-wildlife habitat management coordination techniques on the Chattahoochee National Forest, Ga., in the fall of 1960. The purpose of this stepped-up training program is to improve the integration of wildlife management with other resource management activities and uses on National Forests.

National Forest Protection and Development

Vital to the management of these public land resources are many supporting activities. The forests must be protected from fire, insects, and disease; roads and trails must be improved and extended; land is continuously being exchanged to fill out boundaries or otherwise improve management, and rights-of-way over private lands have to be obtained; land surveying and mapping must be kept current; and equipment to do these and many other jobs has to be developed and improved. All these activities are being stepped up in the overall effort to make National Forest and National Grassland resources better serve the people and the Nation.

NATIONAL FOREST FIRE CONTROL

1960 Fire Season Critical

Calendar year 1960 was one of the alltime bad fire years. Not since 1940 have there been more fires, and not since 1942 did as much area burn on the National Forests. Approximately 12,800 fires burned 421,000 acres. These figures contrast dramatically with the 5-year average of 9,715 fires and 235,388 acres burned. In only 4 other years were there more fires on National Forests.

Loss of Life High

Eighteen persons lost their lives fighting forest fires on the National Forests in 1960. Nine of these were airplane pilots on firefighting missions. Eight of these pilots were employed by contractors and one was a regular Forest Service pilot. An assistant ranger was killed in a helicopter crash, and a seasonal employee died on an observation flight. Two employees were killed by falling trees. Two temporarily employed firefighters were burned to death, and another died of injuries suffered when struck on the head by a rolling rock. One employee was killed in a motor vehicle accident and another died of carbon monoxide poisoning in a motor vehicle.

More Lightning Fires

With but one or two minor exceptions, all regions reported more lightning fires, more man-caused fires, and more area burned. Greatest increases were in the six western regions. In those areas fires were 142 percent of the 5-year average; area burned was 211 percent. Man-caused fires increased nearly 20 percent. Lightning fires were more frequent than in any year since 1940.

Critical fire conditions first developed in the southwestern and California regions, but soon spread to all six western regions. A drought buildup of several years was accentuated when most areas received only half the normal precipitation for the first half of 1960. Many fires broke out in June, some of which became large and difficult to suppress. A mid-July heat wave caused widespread extreme fire danger and culminated in one of the worst fire situations ever experienced. In that 1 month nearly 4,000 fires burned more than 230,000 acres in the western regions.

By mid-July fire control people saw that the fire danger would probably continue for the rest of the season. A plan was prepared to strengthen basic firefighting organizations for the remainder of the fire season.

Fourteen air tanker bases were established or improved. Four 30-man mobile attack crews were organized for use as quickly available organized reinforcements. In late August, as bad fire weather continued and lightning storms remained a constant source of fires, hundreds of supervisory personnel were brought to the west coast from other parts of the country to strengthen the initial attack striking force. This stepped-up striking force in Oregon and California kept scores of August and September fires from becoming major conflagrations.

At peak employment during the height of the fire season, more than 25,000 firefighters were on the job. Equipment in use involved nearly 400 heavy-duty tractors, more than 600 pumpers, and more than 300 aircraft including some 60 helicopters.

Aircraft Use Sets Record

Aircraft use for fire control set a new record in 1960—48,069 hours of flying time. This was 47 percent more flying time than in 1959 and nearly three times more than in 1956. Fixed-wing aircraft flew 38,838 hours and helicopters 9,231 hours; 1959 figures were 26,030 hours and 6,716 hours, respectively. Aircraft carried 59,758 passengers, and 2,786,371 pounds of cargo, increases of 67 percent and 115 percent over 1959. Commercial and privately owned aircraft accounted for 83 percent of the flying time.

A significant step in the growth of aerial firefighting techniques was the establishment of a

special national radio communication system for aircraft in flight and air-to-ground operations. The increased role of smokejumpers and helicopters reflects new methods and techniques. No new method, however, shows such rapid progress as the use of aerial tankers in fighting fire. In 1956, 123,700 gallons of fire retardants were dropped on 24 fires. This method of air attack has grown into a major firefighting tool; in 1959, 3,360,000 gallons were dropped on 507 fires, and in 1960 almost 6 million gallons were dropped on 1,050 fires.

Training

Forest Service training programs insure widespread and effective use of new fire control techniques, particularly safety practices. A 1960 servicewide program taught the coordination of new air attack techniques with ground attack methods. Five Forest Service pilots received helicopter pilot training at Army and Air Force schools. A fire training handbook was completed and issued for field use. Plans were developed during the year for a National Fire Generalship Training School; it was held early in 1961. This is the first such servicewide school. Two new films were released for field training use: "Helicopters in Fire Control" and "Air Tanker Attack."

Equipment Development

The 1960 equipment development program covered more than 100 fire control projects, 43 of them in aerial equipment and accessories. These included performance tests on several new helicopters, a test cabinet for determining the efficiency of spark arresters, a hand-held backfiring torch (available for the 1961 season), and new lightweight sleeping bags. The use of an instrumented dummy helped to determine the danger to ground personnel from air drops of fire retardants.

Fire-resistant clothing was issued for field trials and instructions were prepared on its use. Lightweight aluminized paper shelters promise considerable protection to firefighters from wildfire entrapment; a new cone-type reflective shelter proved particularly successful in extensive tests.

Fire Danger Rating System

A project begun in 1958 is well along in the development of a uniform fire danger rating system; eight different systems are in use throughout the United States. Progress is such that a unified system will be available for testing in selected areas in 1961. It is hoped that an approved unified fire danger rating system will be ready by 1963.

LANDS

The National Grasslands

Eighteen National Grasslands were set up on June 20, 1960, by administrative order of the Secretary of Agriculture. These lands have been administered by this Department since the 1930's and by the Forest Service since 1954. Acreages of the National Grasslands by States are as follows:

	Acres
Colorado	626, 816
Idaho	49, 770
Kansas	107, 114
Nebraska	94, 565
New Mexico	133, 103
North Dakota	1, 104, 330
Oklahoma	46, 211
Oregon	105, 925
South Dakota	864, 984
Texas	115, 243
Wyoming	573, 466
Total	3, 821, 527

National Grasslands are a part of the National Forest System. They are permanently held for administration by the Department of Agriculture. Their resources are managed so as to maintain and improve soil and vegetative cover, and to promote the development of grasslands agriculture in the areas of which the National Grasslands are a part. Thus the basic programs for the National Grasslands are essentially the same as those for the National Forests. The regulations which cover the National Forests are applicable to National Grasslands.

Because these are areas primarily suited to grassland agriculture, the major use is grazing. But a popular and increasing use is outdoor recreation, especially hunting and fishing. These lands furnish food, cover, and water for a variety of wildlife and fish. An estimated 27,000 antelope and 19,000 deer live all or part of the year on the areas. Here also are found quail, prairie chicken, sharptail grouse, pheasants, and many other game and song birds.

Country that was once part of the dust bowl now grows good grass, supporting a healthy livestock economy for many communities. These areas, formerly land utilization projects, were purchased by the Federal Government in the 1930's as an emergency measure. Since then a program of land improvement and adjustment has been going on so that today stabilized grass production has taken the place of poor and uncertain crops. As land utilization projects, however, their future status was uncertain.

The conversion to National Grasslands is another big step in the conservation of vital natural resources. It assures that this large area of public land will now be managed so that its several resources are taken care of and used in the public interest. Thus, the lands will continued to contribute to the national as well as the local economy and welfare.

National Forest Changes

A new National Forest, the St. Francis in Arkansas, was established by Presidential proclamation on November 8, 1960. The new National

Forest, which includes 20,611 acres, is located on the St. Francis River. The lands are mostly forested lands suitable for multiple use management. This area was formerly a land utilization project and has been administered by this Department since the 1930's. By the same proclamation the boundaries of the Ozark National Forest in Arkansas and the Nebraska National Forest in Nebraska were extended to include 53,464 acres of former land utilization projects suitable for National Forest purposes.

By Executive order of October 27, 1960, the boundaries of the Dixie National Forest in Utah were extended to include 5,000 acres of former land utilization project lands and several tracts of public domain totaling about 6,775 acres. Some 14,825 acres of the Widtsoe Land Utilization Project in Utah, intermingled with public domain lands, were transferred to the Department of the Interior for use, administration, and exchange pursuant to the Taylor Grazing Act.

The Forest Service administers 185.6 million acres of publicly owned lands. About 181.4 million acres are within National Forests and related experimental forests and ranges, and about 4.2 million acres are within the National Grasslands and land utilization projects. The United States owns about 80 percent of the lands within the boundaries of the National Forests. The other lands are owned by private individuals, States, counties, and other public agencies. This mixed-ownership pattern complicates land management and resource administration, and a continuing effort is made to consolidate the Federal lands through exchange, purchase, and transfer. The intermingled ownership pattern also is common within the National Grasslands.

Changes in the areas of lands administered by the Forest Service in fiscal 1960 are as follows:

	Acres
Total area administered by Forest Service June 30, 1959	185,654,590
Increases:	
1. Purchased	8,102
2. Conveyed to United States in exchange	26,660
3. Donated to United States	235
4. Transferred from other Federal agencies	6,167
5. Reserved from public domain	121
6. Recomputations, adjustments, and miscellaneous	7,024
Total	48,309
Reductions:	
1. Conveyed by United States in exchange	22,143
2. Grants, sales, reconveyances, mining patents, homesteads, etc	30,737
3. Transferred to other Federal agencies	1,849
4. Eliminated from National Forests and returned to public domain status	7,093
5. Recomputations, adjustments, and miscellaneous	13,119
Total	74,941
Total area administered by Forest Service June 30, 1960	185,627,958

Exchanges and Purchases

During fiscal 1960, 74 exchange transactions were approved authorizing the exchange of 38,843 acres of National Forest lands for 59,701 acres of State, county, or private lands within National Forest boundaries. When these exchanges have been completed, they will help block in the Federal lands as well as consolidate non-Federal properties.

Fifty-eight tracts containing 5,669 acres were approved for purchase under the Weeks law. Seven tracts totaling 2,176 acres were approved for purchase pursuant to public acts applying to the Cache National Forest in Utah and the Superior National Forest in Minnesota.

Pursuant to the Bankhead-Jones Farm Tenant Act, nine exchanges were approved in fiscal 1960 by which the United States will receive 2,080 acres and grant 2,542 acres.

Rights-of-Way

Increasing development of National Forest resources creates an urgent need for rights-of-way across private lands to reach National Forest areas. During fiscal 1960, the Service obtained 417 raw land easements covering 318 miles. From July through November 1960 an additional 217 easements involving 157 miles of road were obtained.

There is increasing cooperation between private landowners and the Forest Service in resolving mutual access problems. During fiscal year 1960, 20 cost-sharing road agreements were made; they involve 120 miles of road and access to over 9 billion board feet of National Forest timber. Other agreements involving an additional 10 billion board feet were in various stages of negotiation. Two road purchases in southwestern Washington were made near the close of 1960. These two roads involve a total of 28 miles and provide access to over 7 billion board feet of National Forest timber.

Land Utilization Projects

During the period 1934–42, the Federal Government bought or reserved from public domain approximately 10 million acres of submarginal or depleted farm, forest, watershed, and rangelands. The Department of Agriculture administered these lands in units known as land utilization projects. After the initial emergency relief legislation of 1933 and 1935, title III of the Bankhead-Jones Farm Tenant Act (1937) became the basic authority for acquisition, use, and management of these lands; it directed the Secretary of Agriculture to develop a program of land conservation and utilization.

Almost all of these federally owned lands have now acquired permanent status under approved conservation or land use programs. By assignment, transfer, and sale, most of these projects have been incorporated into National Forests, National Grasslands, National Parks, Indian reservations, wildlife management areas, State

forests and parks, and research or other conservation projects.

Prior to 1954 the Forest Service had been assigned custody of 563,000 acres of land utilization projects and about 2½ million acres had been assigned or transferred to other agencies. In 1954 an additional 7.2 million acres were transferred for administration to the Forest Service. Since that time the Department has completed management arrangements for these lands to assure their best permanent use. The following assignments, sales, and transfers have been made:

	Acres
Designated National Grasslands	3,821,500
Transferred to the Department of the Interior	2,201,700
Included in National Forests by proclamation and Executive order	381,000
Granted to States and public agencies	805,500
Under approved or pending sales contracts with States	177,700
Placed in trust for Pueblo Indians, act of Aug. 2, 1956	77,600
Transferred or pending transfer to Corps of Engineers	14,600
Held for research and administrative purposes	14,300
Approved for management pending other status or exchange	363,400

ENGINEERING

Development of National Forest resources involves engineering skills in virtually all phases. Roads, trails, and bridges provide needed access to the forest for fire control, hunting, logging, recreation, stand improvement, and many other purposes. Dams and stream improvements contribute to better range, wildlife, and watershed conditions. Aerial photography, surveys, and maps are essential tools for efficient administration and resource management. Engineering accomplishments for 1960 covered a wide range of engineering skills.

Aerial Photography

Aerial photography in recent years has become an important tool for mapping and for forest resource management. In fiscal year 1960, for resource inventory and management purposes the Forest Service contracted for aerial photography of 21,962 square miles. Topographic mapping needs called for an additional 712 square miles to be photographed under contracts let in fiscal year 1960.

Because a need for increased aerial photography was foreseen in fiscal year 1959, much of the work was contracted for at that time. As a result, a reduced amount of coverage was scheduled or contracted for in fiscal year 1960. The unavoidable timelag between contract award and delivery of materials meant that finished work received in 1960 was largely the result of the fiscal year 1959 contracts.

Surveys and Maps

Forest Service map coverage requirements increased during the fiscal year from 725,615 square miles to 773,214 square miles. Creation of the National Grasslands from 22 Bankhead-Jones land utilization projects accounted for most of the expanded mapping needs; under the new designation these lands become a permanent part of the National Forest System. Mapping requirements necessarily include, in addition to Forest Service administered lands, intermixed or adjoining private lands.

In fiscal year 1960 the Forest Service produced planimetric maps for 57,000 square miles of National Forest and adjoining or intermingled lands. Reliable planimetric maps now cover 372,236 square miles, or approximately 48 percent of the area needing coverage.

The Forest Service estimates it needs topographic map coverage for 618,854 square miles. At the end of the fiscal year there were satisfactory topographic maps available for slightly less than 37 percent of the required coverage. During the year work was completed on topographic maps covering 1,003 square miles. In addition the U.S. Geological Survey produced topographic maps for 20,613 square miles of National Forest and intermingled or adjoining lands.

Boundary Survey and Marking

Calendar year 1960 accomplishments in the Land Line Location Program were facilitated by collaboration with other agencies and industries, particularly those with large timber holdings. Field search was made for 14,338 corners. Evaluation of evidence showed that 8,947 of those corners could be remonumented without further cadastral surveys. The other 5,391 corners lacked sufficient evidence for certification and must be surveyed before they can be remonumented.

During 1960, 3,719 corners were permanently monumented with standard brass capped iron pipes or concrete posts. Survey crews marked and posted 426 miles of National Forest property lines. Another 4,017 miles of property lines were marked temporarily pending confirmation. Forest Service regions conducted 23 training seminars, in which they trained 204 forest officers and technicians in corner search and evaluation.

Buildings

The Forest Service spent about $4,610,000 during fiscal year 1960 to construct or purchase new administrative buildings and to improve existing buildings. New buildings include 86 dwellings, 44 barracks and cabins, 22 lookouts, and 95 other types such as offices, warehouses, messhalls, and garages. Construction was also completed on the eight research laboratories started in fiscal year 1959; total cost for these was about $3 million. Plans were initiated for another four laboratories included in the fiscal year 1961 program, at a total program cost of $1,075,000. The four new labora-

tories are to be located at Marquette, Mich.; Stoneville, Miss.; Raleigh-Durham, N.C.; and Corvallis, Oreg.

The size of the current and projected building program prompted responsible officials to call a buildings conference at the Forest Products Laboratory in February 1960. Thirty Forest Service engineers, architects, and administrators attended the conference. They reviewed design criteria for administrative buildings, adopted a preliminary draft of a buildings handbook, and gave special attention to the effective use of wood and wood products in building construction.

Water Developments

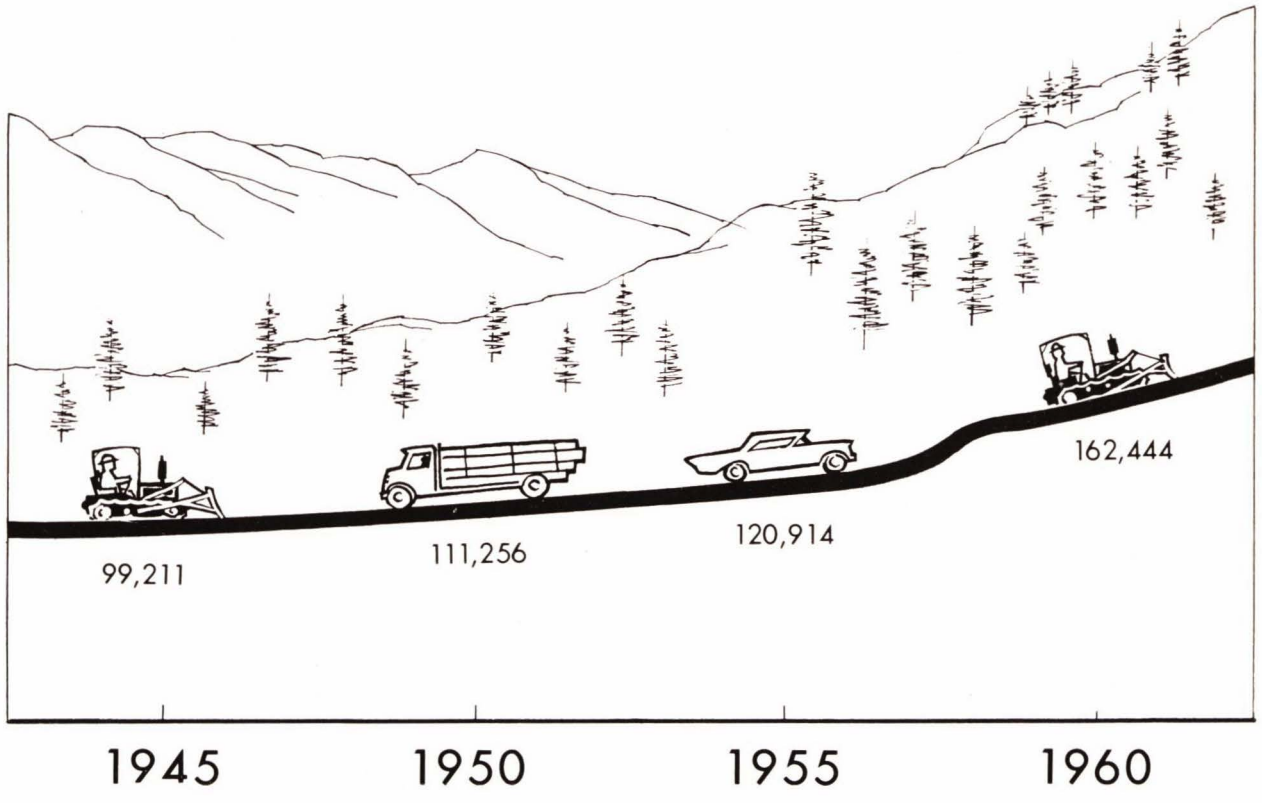
The Federal Power Commission set an important precedent in the recent licensing of a hydroelectric power project on the Eldorado National Forest in California. Acting upon Forest Service recommendations, the Commission ordered that project boundaries on the major reservoir be expanded to include certain intermingled private lands with high public recreation value. The licensee will be required to buy the additional private lands and to make them available for public use. Authority for such action is the Federal Power Act requirement that a project ". . . be best adapted to a comprehensive plan . . . for the improvement and utilization of waterpower resources, and other beneficial public uses, including recreation purposes."

The Commission's action is a big step toward harmonious development of public recreation resources on intermingled private and National Forest lands around reservoir sites. Project boundaries formerly had been established only as necessary for operation and maintenance of the project.

Transportation System

As of June 30, 1960, the transportation system used for the protection, use, and management of the National Forests consisted of approximately 162,400 miles of roads, 106,500 miles of supplemental foot and horse trails, and 249 landing fields for fixed-wing aircraft. This system is maintained in part by the Federal Government, and in part by State and local authorities, private cooperators, permittees, and timber purchasers.

MILEAGE OF THE NATIONAL FOREST ROAD SYSTEM



The following tabulation shows how the roads and trails in the system were maintained in fiscal year 1960:

	Estimated mileage	
	Roads	*Trails*
Maintained for traffic or cared for and preserved by the Government	95, 352	105, 799
Maintained for traffic by others	67, 092	702
Total	162, 444	106, 501

In fiscal year 1960 the funds obligated for maintenance, construction, and reconstruction of forest roads and trails totaled $43,151,102. In addition, Federal timber purchasers built or reconstructed roads with an estimated value of $47,439,149.

Construction and reconstruction work completed on the National Forest transportation system in fiscal year 1960 was as follows:

	Units of work completed	
	By the Government	*By Federal timber purchasers*
Roads (miles)	851	3, 841
Trails (miles)	142	----------
Bridges (number)	471	36

Program Planning and Legislation

PROGRAM PLANNING AND SPECIAL PROJECTS

Small Ownership Study Continued

Measures were being developed for an adequate program to help assure that farm and other small woodlands of the country will meet their share of the Nation's future timber needs. The overriding objective is the attainment of some 50 billion board feet of growth needed annually by the year 2000, with emphasis on softwoods and sawtimber.

Measures being studied are aimed at specific actions believed to be necessary to reach this goal, including the accomplishment of needed planting, stand improvement, adoption of better management and harvesting practices, and intensified protection largely within the next two decades. Under study are (1) eligibility of participants, (2) major provisions and requirements, (3) special organizational and operational features, (4) financing, (5) responsibilities, and (6) needed authority and necessary coordination.

The cooperative approach to getting the job done is being studied as a feature of each of the measures. This would involve sharing of responsibilities and costs by State, Federal, and private sources.

Increases in Recreation Demand Expected

Final projections and allocations of recreation demand on the National Forests by States and types of recreational use in 1976 and 2000 were developed. These projections show a potential increase in recreation visits to National Forests from 81 million in 1959 to 230 million by 1976, and a possible 635 million by 2000. The projected increase of nearly three times present use by 1976 and eight times by the year 2000 reflects the combined influence of expected increases in personal income, leisure time, and mobility far more than it does the projected rate of increase in population.

Distribution of projected statewide visits to individual National Forests and the allocation of forest visits by type of use reflects changes in the use pattern expected to result from anticipated highway expansion, construction of new reservoirs, differing rates of population growth, and other factors likely to affect recreation use at the local level. Camping and picnicking appear likely to take on added importance in the future, increasing from about 40 percent at present to 53 percent of projected total visits for 2000. Partially offsetting this is a projected decline in camping and picnicking outside of areas specifically developed for these purposes.

Despite large absolute increases in visits for hunting, fishing, swimming, boating, winter sports, hiking and riding, organization camps, hotels and resorts, recreation residences, and wilderness, the percentage each represents of projected total visits in 2000 is indicated to be about the same or only slightly less than at present.

Soil and Water Inventory Review Completed

The review of State and county estimates of needs for conservation treatment on non-Federal forest land was concluded during the year. Recommendations regarding the adequacy of such estimates were submitted for consideration of the Department Needs Committee. The estimates, as of 1975, mainly involved acreage of forest land needing reforestation and stand improvement, and areas not now receiving adequate protection from fire, insects and disease, and animals. Most questions raised by the Forest Service Review Committee concerned the protection estimates.

LEGISLATIVE REPORTING

The 1960 Multiple Use-Sustained Yield Law

The Multiple Use-Sustained Yield Act of 1960 is one of the major pieces of legislation affecting the Forest Service. It makes clear that no statutory priority is given to one resource over another and recognizes that establishment and maintenance of wilderness areas are consistent with the purposes of the act.

This is the first act specifically recognizing National Forest wilderness. The act makes clear that it will not have an adverse effect on the utilization of minerals on the National Forests, nor on the responsibility of the States with respect to fish and game. This is basic organic legislation for the National Forests, which, along with the 1897 act, provides the fundamental charter for National Forest management and development. The full text of the act appears at the end of this section.

Legislative Review

The Forest Service followed on a day-to-day basis about 700 bills that would affect Forest Service activities. This was exclusive of many bills of

general nature which would have government-wide application. It prepared or reviewed 115 legislative reports and provided a number of Congressmen with legislative drafting service. Testimony was given before congressional committees on 14 bills, exclusive of appropriation bills. Thirty-six bills of direct interest to the Forest Service were enacted during the year.

PUBLIC LAW 86–517

86TH CONGRESS, H.R. 10572

June 12, 1960

AN ACT

To authorize and direct that the national forests be managed under principles of multiple use and to produce a sustained yield of products and services, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That it is the policy of the Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes. The purposes of this Act are declared to be supplemental to, but not in derogation of, the purposes for which the national forests were established as set forth in the Act of June 4, 1897 (16 U.S.C. 475). Nothing herein shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish on the national forests. Nothing herein shall be construed so as to affect the use or administration of the mineral resources of national forest lands or to affect the use or administration of Federal lands not within national forests.

SEC. 2. The Secretary of Agriculture is authorized and directed to develop and administer the renewable surface resources of the national forests for multiple use and sustained yield of the several products and services obtained therefrom. In the administration of the national forests due consideration shall be given to the relative values of the various resources in particular areas. The establishment and maintenance of areas of wilderness are consistent with the purposes and provisions of this Act.

SEC. 3. In the effectuation of this Act the Secretary of Agriculture is authorized to cooperate with interested State and local governmental agencies and others in the development and management of the national forests.

SEC. 4. As used in this Act, the following terms shall have the following meanings:

(a) "Multiple use" means: The management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

(b) "Sustained yield of the several products and services" means the achievement and maintenance in perpetuity or a high-level annual or regular periodic output of the various renewable resources of the national forests without impairment of the productivity of the land.

Approved June 12, 1960.

Administration

As the Forest Service was girding to meet bigger demands of the present and the future, much attention was being devoted to its own operations, its employees, its internal and external relations. This was a year of self-examination. This was a time of looking inward at the administrative functions of all levels to see how they could be strengthened and improved. The Service's capacity to accomplish new and difficult tasks is based on inner strength: its integrity of purpose, the efficiency of its management, clarity of its communications, the morale and competence of its people, and the understanding and support of the public which it serves.

To increase this inner strength was a major objective. With its own house in order and running smoothly, the Service's ultimate responsibilities will be discharged. And the forests may contribute their full potential to a fast-growing Nation through accelerated resource management, broader research efforts, and general forestry leadership.

Functions being modernized and improved were Administrative Management, Administrative Services, Personnel Management, Information and Education, and Budget and Finance. Following are a few examples of progress.

Work Planning

A uniform National Forest work planning system was installed serviceable this year. This system provides a direct tie between plans for high priority work and available financing, and gives the flexibility needed to handle the multiple use management job of the Forest Service.

Workload Analysis

The 5-year revision of the correlated workload analysis for the National Forests was completed this year and was used as a base for fiscal 1961 allotments. Several improvements were made to blend in with the uniform work planning system.

National Forest correlated job standards and unit time allowance converting factors were developed and issued in handbook form for field use. These standards and converting factors will provide guidance in computing workloads, evaluating accomplishment, and in compiling realistic work plans.

Organization Study

A comprehensive study of Forest Service organization, made under contract by McKinsey & Co., Inc., was completed. It included a critical analysis and evaluation of the present organization and recommended improvements based on present needs and future requirements of expanding Forest Service programs.

Defense Activities

The Forest Service in cooperation with local, State, and Federal agencies is responsible for developing plans for a national program and directing activities relating to the prevention and control of fires that might be caused by enemy attack on the rural areas of the United States.

A study to improve procedures for rural fire damage assessment following nuclear attack was completed. Another study was made of the possible effects of mass fires on people in shelters.

Assistance was given the Office of Civil and Defense Mobilization in developing material for staff and command training for the Nation's senior fire officials.

A Memorandum of Understanding has been signed by the Forest Service and the Business and Defense Services of the Department of Commerce whereby the Forest Service will assist in defense planning and emergency operations involving forests and forest products.

A nationwide network of monitoring stations to provide radiological information has been established. Instruments have been placed at 310 Forest Service stations and many instructors and monitors trained.

Public Wants More Information

Greater public interest in forestry and related natural resources was being dramatically demonstrated by the increasing number of requests for publications and other information. These written requests to all Forest Service offices in 1960 totaled some 689,000, excluding mail to Smokey Bear headquarters.

About 66,000 written requests for publications were serviced by the Washington office, along with 5,000 telephone inquiries. For this one office there was an increase of 16,000 written requests over 1959. In addition, requests to 10 regional offices, experiment stations, the Forest Products Laboratory, and research centers amounted to approximately 623,000. All Forest Service offices reported a heavy increase over the previous year; over the past 5 years the number of such requests has at least doubled.

Exact records of requests are not kept by all Forest Service offices. However, these figures are believed to be on the conservative side.

PERSONNEL

Recruitment of Forest Service personnel in 1960 proved to be more successful than it was in the previous year from both a quality and a quantity standpoint. Two factors appear to have been primarily responsible for this: first, recruiting efforts were more intensive; and, second, slackening in other job opportunities increased interest in the Forest Service as an employer.

In all, 598 high-quality professionals were recruited in 1960. These included 317 foresters, 23 research foresters, 100 engineers, and 50 business management graduates, and the other 108 were for various specialties from nematologists to landscape architects. Engineers continue to be in short supply, otherwise, the Forest Service was able to attract professional personnel in sufficient numbers to carry out established programs.

Recruitment of full-time employees not classed as professional totaled 765. These included aids, technicians, clerks, stenographers, laborers, and a variety of skilled workers, all vital to Forest Service operations. Qualifications of people employed in these categories showed marked improvement over the past.

Part-time and intermittent employment remained constant at about 3,000.

Continued attention was given to training and developing Forest Service employees.

Safety Record Declines

The servicewide safety record took a turn for the worse. Man-hours worked increased 12 percent, but the disabling injury frequency—exclusive of occupational illnesses—increased 41 percent. The number of lost-time injuries increased 59 percent. Nineteen employees, contractors, or cooperators were killed, all but one of them on forest fires. Much of this increase is attributed to the extreme forest fire season in the West.

Region and station safety experts met in Chicago in October to plan strategy for the decade ahead. Fire control was represented. Training in basic supervision and leadership received the greatest emphasis.

BUDGET AND FINANCE

A study was initiated to determine the maximum feasible extent of the automatic data-processing operations in the Forest Service. To be completed in fiscal 1961, the study will cover organization, types of machines and utilization, employment levels, new applications, and related information. Business management inspection standards and guides for use by National Forests are being developed. This will permit the entire field of business management to be examined uniformly and concurrently with related subjects on the ranger districts.

Working capital fund activities were expanded to include subsistence operations. Action was also initiated to improve the records and management of fleet operations under this fund.

RECEIPTS AND EXPENDITURES

Receipts from the National Forest resources amounted to $146,348,225 in fiscal year 1960. Sources of the receipts were as follows:

Timber	$139,903,416
Grazing	3,664,564
Other	2,780,245
Total	146,348,225

Included are receipts of $4,544,826 from National Forest revested Oregon and California Railroad grant lands.

Additional resource revenue included $1,864,336 from National Grasslands and land utilization areas (title III of the Farm Tenant Act). Other money received included: $1,117,631 contributed by cooperators and timber purchasers for cooperative work on National Forest programs; $15,263,369 set aside for timber sale area betterment; $7,222,001 set aside for brush disposal; $909,863 from miscellaneous receipts; $6,428 for restoration of forest lands and improvements; and $24,682 for construction of warehouse and related facilities.

Thus receipts from all sources totaled $172,756,535. In addition, the value of roads built by timber purchasers through allowances in selling prices of timber was estimated at $47,439,149. Operating expenses for National Forest programs, National Grasslands and land utilization projects amounted to $111,729,614, and depreciation on roads, trails, and other improvements was estimated at $28,539,000. Receipts and other income exceeded operating expenditures and other charges by $79,927,070 for fiscal year 1960.

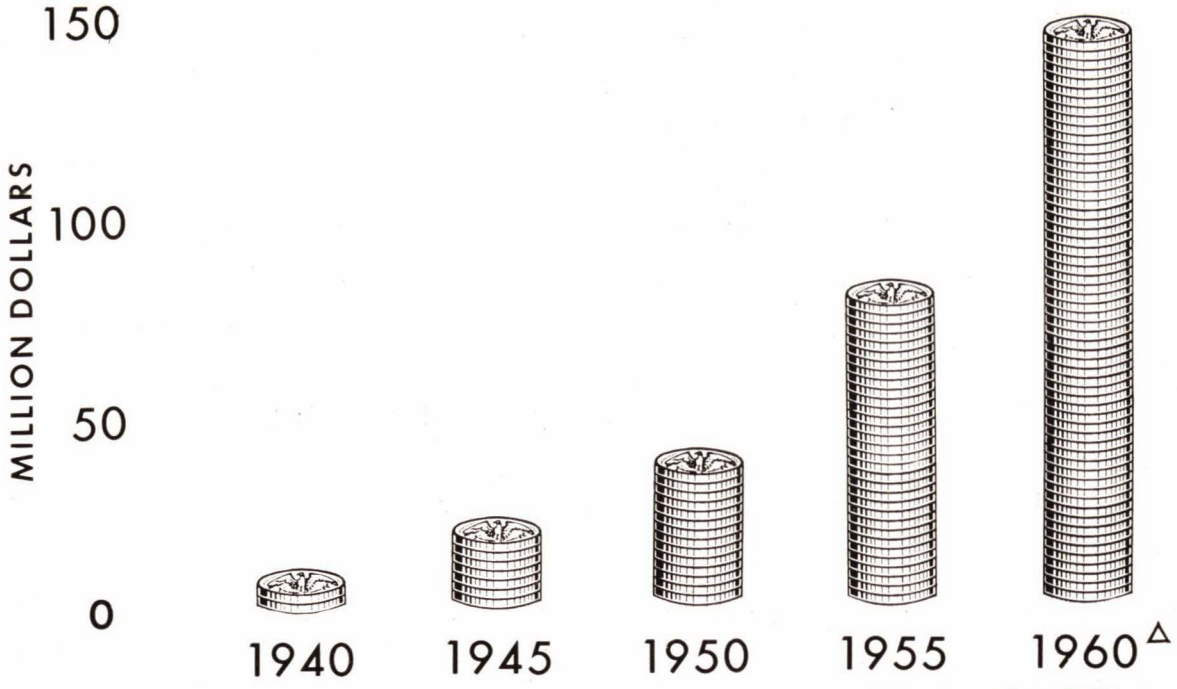
Expenditures for other Forest Service activities included $18,110,514 for cooperative State and private forestry programs, and $15,442,483 on forestry research.

Under the act of May 23, 1908, as amended, 25 percent of the National Forest net receipts is paid to States for schools and roads within counties having National Forest land. In fiscal 1960 this amounted to $29,668,588. Under the act of June 20, 1910, $113,861 was paid to Arizona and New Mexico school funds; $121,309 was paid to the State of Minnesota under the act of June 22, 1948; and $452,894 was paid to counties from calendar year 1959 receipts from National Grasslands and land utilization areas under the act of July 22, 1937.

Ten percent of receipts from National Forest resources, except receipts from revested O. & C. lands, is appropriated to the Forest Service for expenditure on roads and trails within the National Forests. This amounted to $14,165,522 in fiscal 1960.

RECEIPTS FROM THE NATIONAL FOREST SYSTEM *

Timber, Grazing and Other Uses



*25% OF RECEIPTS RETURNED TO COUNTIES FOR SCHOOLS AND ROADS; 10% OF NATIONAL FOREST RECEIPTS RESERVED FOR FOREST ROADS AND TRAILS.

ΔINCLUDES $1.86 MILLION RECEIPTS FROM NATIONAL GRASSLANDS AND L. U. PROJECTS.

Internal Audit

During calendar year 1960, the staff of Internal Audit, an independent unit directly responsible to the Chief of the Forest Service, completed audits of four regions, four experiment stations, the Forest Products Laboratory, and the Tropical Research Center. With the exception of the Tropical Center, this was the second audit performed at each of these locations since Internal Audit was established in 1957.

In addition, the 3 field offices audited 53 forests in 1960, bringing the total forests audited to 123 at the close of the year. The second cycle of auditing each forest will be started during calendar year 1961.

Statistical Tables

TABLE 1.—*National Forest and other lands administered by the Forest Service, as of June 30, 1960*

State and Commonwealth	National Forest	National Grassland	Land utilization and other	Total
	Acres	*Acres*	*Acres*	*Acres*
Alabama	631, 111		661	631, 772
Alaska	20, 742, 224			20, 742, 224
Arizona	11, 328, 957		52, 604	11, 381, 561
Arkansas	2, 368, 338		36, 692	2, 405, 030
California	19, 939, 477		23, 882	19, 963, 359
Colorado	13, 714, 353	626, 816	9, 318	14, 350, 487
Florida	1, 074, 758			1, 074, 758
Georgia	777, 110		9, 328	786, 438
Idaho	20, 299, 631	49, 770		20, 349, 401
Illinois	211, 013			211, 013
Indiana	118, 750		3, 180	121, 930
Iowa	4, 749		547	5, 296
Kansas		107, 114		107, 114
Kentucky	459, 084			459, 084
Louisiana	591, 566			591, 566
Maine	45, 862		4, 159	50, 021
Massachusetts			1, 651	1, 651
Michigan	2, 552, 027		7, 385	2, 559, 412
Minnesota	2, 787, 407			2, 787, 407
Mississippi	1, 132, 752		1, 221	1, 133, 973
Missouri	1, 361, 635		12, 938	1, 374, 573
Montana	16, 635, 730			16, 635, 730
Nebraska	206, 082	94, 565	39, 069	339, 716
Nevada	5, 058, 028			5, 058, 028
New Hampshire	677, 559			677, 559
New Mexico	8, 565, 501	133, 103	299, 389	8, 997, 993
New York			13, 747	13, 747
North Carolina	1, 124, 152			1, 124, 152
North Dakota	520	1, 104, 330		1, 104, 850
Ohio	106, 517		138	106, 655
Oklahoma	221, 672	46, 211		267, 883
Oregon	14, 832, 881	105, 925		14, 938, 806
Pennsylvania	470, 869			470, 869
South Carolina	587, 273			587, 273
South Dakota	1, 120, 820	864, 984	18, 200	2, 004, 004
Tennessee	594, 770		1, 212	595, 982
Texas	657, 995	115, 243	2, 025	775, 263
Utah	7, 844, 937		77, 064	7, 922, 001
Vermont	231, 901			231, 901
Virginia	1, 446, 132		2, 683	1, 448, 815
Washington	9, 688, 619			9, 688, 619
West Virginia	903, 980			903, 980
Wisconsin	1, 467, 436		1, 307	1, 468, 743
Wyoming	8, 570, 789	573, 466		9, 144, 255
Puerto Rico	33, 037		27	33, 064
Total	181, 188, 004	3, 821, 527	618, 427	185, 627, 958

TABLE 2.—*Area of commercial timberland and volume of sawtimber in the National Forests, Jan. 1, 1961*

State	Commercial forest land	Sawtimber volume	State	Commercial forest land	Sawtimber volume
	Thousand acres	*Million board feet*		*Thousand acres*	*Million board feet*
Alabama	624	1, 506	Nevada	204	172
Alaska	5, 375	155, 789	New Hampshire	452	858
Arizona	2, 250	14, 403			
Arkansas	2, 293	3, 247	New Mexico	3, 090	8, 367
California	8, 628	141, 035	North Carolina	975	1, 954
			Ohio	88	145
Colorado	6, 262	24, 999	Oklahoma	211	211
Florida	1, 030	665	Oregon	11, 064	225, 639
Georgia	764	1, 314			
Idaho	9, 335	67, 631	Pennsylvania	451	553
			South Carolina	559	1, 718
Illinois	184	532	South Dakota	972	2, 190
Indiana	112	162	Tennessee	587	1, 144
Kentucky	439	1, 272	Texas	640	2, 558
Louisiana	569	1, 240			
Maine	51	55	Utah	2, 158	8, 461
			Vermont	199	665
Michigan	2, 410	2, 380	Virginia	1, 070	1, 611
Minnesota	2, 193	2, 731	Washington	5, 723	132, 266
Mississippi	1, 108	2, 467	West Virginia	869	1, 605
Missouri	1, 334	1, 151	Wisconsin	1, 367	1, 049
Montana	10, 496	46, 740	Wyoming	3, 449	17, 074
Nebraska	30	50			
			Total or average	89, 615	877, 609

TABLE 3.—*Volume and value of timber cut from the National Forests, and area planted and seeded to trees, fiscal year 1960*

State and Commonwealth	Timber cut		Area planted and seeded to trees	
	Volume	Value	Fiscal year 1960	Total through June 30, 1960
	Thousand board feet	*Dollars*	*Acres*	*Acres*
Alabama	68, 452	1, 709, 508	2, 885	52, 499
Alaska	321, 945	786, 241	889	1, 719
Arizona	198, 475	2, 002, 788	161	3, 158
Arkansas	198, 730	5, 378, 352	6, 619	26, 290
California	1, 511, 719	24, 540, 545	14, 088	96, 627
Colorado	156, 587	1, 235, 973	1, 403	71, 734
Florida	71, 153	1, 126, 109	4, 970	45, 521
Georgia	45, 502	1, 187, 960	3, 320	26, 239
Idaho	765, 727	8, 299, 718	4, 124	116, 094
Illinois	4, 033	60, 700	383	44, 194
Indiana	2, 099	23, 976	866	21, 611
Iowa			20	60
Kentucky	18, 726	280, 970	283	1, 383
Louisiana	90, 471	1, 802, 368	9, 911	125, 097
Maine	2, 533	42, 593		67
Michigan	138, 514	928, 874	6, 593	573, 393
Minnesota	140, 569	895, 938	5, 173	155, 485
Mississippi	131, 472	2, 984, 103	8, 406	168, 328
Missouri	20, 555	234, 894	2, 343	75, 897
Montana	480, 043	5, 291, 183	2, 850	52, 032
Nebraska	8	80	20	30, 065
Nevada	529	3, 990	29	431
New Hampshire	17, 032	254, 881	8	1, 170
New Mexico	91, 880	908, 375	74	3, 256
New York	68	159		
North Carolina	41, 954	833, 601	1, 867	19, 461
North Dakota	40	411		
Ohio	4, 051	38, 467	1, 029	16, 918
Oklahoma	8, 053	163, 498	85	196
Oregon	2, 847, 237	60, 321, 821	35, 653	208, 339
Pennsylvania	17, 825	593, 269	369	18, 641
South Carolina	52, 954	1, 363, 378	705	20, 414
South Dakota	53, 621	582, 738	1, 514	37, 983
Tennessee	21, 667	389, 028	601	7, 329
Texas	119, 420	2, 884, 181	1, 151	52, 148
Utah	61, 955	407, 737	94	4, 169
Vermont	6, 385	128, 548	13	1, 419
Virginia	37, 657	285, 431	332	5, 140
Washington	1, 433, 296	26, 920, 769	13, 094	182, 143
West Virginia	27, 094	441, 941	278	16, 500
Wisconsin	63, 653	455, 163	1, 786	229, 749
Wyoming	93, 128	631, 526	268	8, 037
Puerto Rico	85	2, 006		
Total or average	9, 366, 897	156, 423, 791	134, 257	2, 520, 936

TABLE 4.—*Number of livestock permitted to graze on the National Forests, National Grasslands, and Land Utilization Projects, calendar year 1960*

NATIONAL FORESTS

State	Cattle, horses, and swine		Sheep and goats	
	Paid permits	Livestock permitted to graze	Paid permits	Livestock permitted to graze
	Number	*Number*	*Number*	*Number*
Alabama	64	658	0	0
Alaska	0	16	0	0
Arizona	922	152, 529	21	67, 297
Arkansas	158	2, 119	0	0
California	1, 184	104, 071	64	100, 068
Colorado	1, 587	146, 295	422	505, 889
Florida	29	1, 312	0	0
Georgia	93	1, 007	0	0
Idaho	1, 805	114, 679	314	556, 947
Illinois	4	62	0	0
Indiana	2	10	0	0
Iowa	6	132	0	0
Louisiana	52	1, 388	0	0
Michigan	33	462	0	22
Minnesota	17	184	1	18
Mississippi	145	1, 490	0	0
Missouri	217	2, 408	0	0
Montana	1, 683	117, 328	110	175, 155
Nebraska	119	14, 347	0	0
Nevada	244	56, 686	40	125, 231
New Mexico	1, 694	81, 722	106	68, 094
North Carolina	9	135	0	0
Ohio	9	19	0	0
Oklahoma	21	483	0	0
Oregon	844	73, 373	87	121, 210
Pennsylvania	2	35	0	0
South Carolina	37	377	0	0
South Dakota	520	20, 674	16	9, 623
Tennessee	9	159	0	0
Texas	118	1, 446	0	0
Utah	2, 471	102, 748	600	426, 405
Vermont	5	50	0	0
Virginia	6	113	1	40
Washington	427	26, 063	17	19, 672
West Virginia	55	596	20	499
Wisconsin	12	189	0	0
Wyoming	999	115, 590	187	346, 968
Total	15, 602	1, 140, 955	2, 006	2, 523, 138
NATIONAL GRASSLANDS				
Colorado	325	19, 909	0	0
Idaho	74	2, 667	0	0
Kansas	92	3, 061	0	0
Nebraska	45	3, 241	6	2, 726
New Mexico	95	4, 247	0	0
North Dakota	665	52, 914	10	1, 700
Oklahoma	183	4, 522	0	0
Oregon	55	2, 510	4	6, 470
South Dakota	515	46, 188	26	12, 158
Texas	178	5, 462	0	0
Wyoming	182	15, 454	62	20, 235
Total	2, 409	160, 175	108	43, 289

TABLE 4—Continued

LAND UTILIZATION PROJECTS

State	Cattle, horses, and swine		Sheep and goats	
	Paid permits	Livestock permitted to graze	Paid permits	Livestock permitted to graze
	Number	*Number*	*Number*	*Number*
California	16	670	0	0
Colorado	9	105	0	0
Iowa	1	41	0	52
Missouri	51	1, 067	0	0
New Mexico	91	1, 795	14	7, 732
New York	127	1, 880	1	136
South Dakota	7	570	0	0
Texas	1	55	0	0
Wisconsin	1	20	0	0
Total	304	6, 203	15	92 7, 0

TABLE 5.—*Estimated legal harvest* [1] *of big-game animals on the National Forests, fiscal year 1960*

State	Deer	Elk	Bear	Bighorn	Total big game [2]
	Number	*Number*	*Number*	*Number*	*Number*
Alabama	800				800
Alaska	11, 000	130	740	10	13, 000
Arizona	24, 000	290	150		26, 000
Arkansas	1, 700				1, 700
California	41, 000		900		42, 000
Colorado	63, 000	10, 000	690	40	74, 000
Florida	1, 600		25		1, 600
Georgia	1, 100				1, 100
Idaho	34, 000	11, 000	1, 600	70	48, 000
Illinois	800				800
Indiana	170				170
Kentucky	250				250
Louisiana	1, 200				1, 200
Maine	120		3		120
Michigan	28, 000		370		28, 000
Minnesota	18, 000		270		18, 000
Mississippi	1, 500				1, 500
Missouri	4, 600		1		4, 600
Montana	50, 000	9, 000	1, 145	85	62, 000
Nebraska	830				990
Nevada	12, 000				12, 000
New Hampshire	590		60		650
New Mexico	28, 000	450	190	2	29, 000
North Carolina	2, 400		130		2, 600
North Dakota	5, 900				7, 600
Ohio	310				310
Oklahoma	55				55
Oregon	66, 000	6, 000	750		73, 000
Pennsylvania	5, 900		30		5, 900
South Carolina	380				380
South Dakota	11, 000	10			12, 000
Tennessee	670		10		830
Texas	580				580
Utah	92, 000	1, 300	60		93, 000
Vermont	900		60		960
Virginia	15, 000	5	320		15, 000
Washington	16, 000	3, 000	1, 300		21, 000
West Virginia	5, 500		45		5, 600
Wisconsin	14, 000		210		14, 000
Wyoming	26, 000	8, 900	295	70	39, 000

[1] Figures rounded in posting and totals.

[2] Also includes antelope, moose, mountain goat, peccary, and wild boar.

TABLE 6.—*Construction, reconstruction, and maintenance of National Forest (forest developments) roads, bridges, and trails, fiscal year 1960*

State and Commonwealth	Roads		Bridges, construction, reconstruction, and replacement	Trails		Total obligations from all funds [1]
	Construction and reconstruction	Existing		Construction and reconstruction	Existing	
	Miles	*Miles*	*Number*	*Miles*	*Miles*	*Dollars*
Alabama	1. 8	1, 478. 2				175, 639
Alaska	2. 6	251. 4	1		603. 8	772, 779
Arizona	59. 9	9, 653. 7	8	3. 4	3, 550. 4	1, 221, 035
Arkansas	5. 6	4, 368. 9				523, 938
California	106. 6	28, 661. 2	21	13. 6	15, 447. 3	7, 491, 320
Colorado	69. 7	7, 539. 2	37	12. 2	8, 322. 7	1, 958, 863
Florida	1. 9	1, 445. 2	1			214, 993
Georgia	5. 1	2, 621. 4	2		182. 6	197, 922
Idaho	123. 4	15, 241. 5	89	19. 4	20, 807. 5	5, 170, 989
Illinois		841. 3				59, 373
Indiana	. 5	299. 5				10, 592
Iowa						
Kentucky	17. 0	1, 240. 1			13. 5	306, 614
Louisiana	3. 7	1, 395. 9	6			208, 763
Maine	2. 0	51. 3			85. 4	23, 627
Michigan	16. 5	3, 827. 4				646, 742
Minnesota	25. 1	2, 419. 5	12		471. 6	1, 127, 993
Mississippi	26. 8	2, 523. 2	1			271, 068
Missouri	1. 6	2, 329. 9	1			176, 184
Montana	42. 0	11, 146. 2	58	38. 1	16, 171. 8	3, 411, 888
Nebraska		285. 2				21, 897
Nevada		2, 826. 0	5	1. 0	1, 667. 1	169, 333
New Hampshire	2. 4	203. 8	1		996. 2	439, 649
New Mexico	31. 9	6, 500. 0	21		3, 469. 9	1, 195, 502
North Carolina	2. 6	2, 757. 7	6		1, 207. 6	327, 479
North Dakota		. 3				
Ohio		237. 0				66, 650
Oklahoma		499. 0				47, 015
Oregon	39. 7	19, 960. 7	79	24. 2	10, 200. 9	7, 257, 588
Pennsylvania	8. 7	358. 4			166. 6	190, 833
South Carolina	5. 9	1, 718. 5	2			183, 502
South Dakota	10. 4	3, 765. 0	22		10. 3	255, 540
Tennessee	12. 2	1, 107. 3	2		507. 1	296, 903
Texas	9. 6	1, 628. 3				256, 319
Utah	70. 0	5, 666. 2	23		6, 369. 3	1, 147, 489
Vermont	1. 7	248. 5			185. 0	162, 986
Virginia	32. 7	1, 484. 3	9		862. 0	435, 130
Washington	26. 9	8, 301. 3	45	18. 3	8, 862. 8	4, 551, 038
West Virginia	13. 9	1, 343. 6	3		754. 9	298, 317
Wisconsin	16. 9	1, 933. 1	6			417, 105
Wyoming	53. 2	4, 256. 3	10	11. 7	5, 555. 7	888, 135
District of Columbia [2]						564, 626
Puerto Rico	— . 1	28. 5			29. 3	4, 744
Total	850. 6	162, 444. 0	471	141. 9	106, 501. 3	43, 151, 102

[1] Total obligations are for construction, reconstruction, and maintenance.
[2] Administrative expenses.

TABLE 7.—*Use of recreation resources on the National Forests, calendar year 1960*

State and Commonwealth	Number of visits to—								
	Campgrounds	Picnic areas	Winter sports areas	Organization camps	Hotels or resorts	Recreation residences	Wilderness areas	Other forest areas	Total
Alabama	4, 400	98, 900	0	1, 100	0	0	0	95, 500	199, 900
Alaska	79, 900	127, 900	8, 600	1, 500	79, 900	17, 200	0	689, 700	1, 004, 700
Arizona	666, 000	1, 589, 900	82, 600	40, 700	311, 800	40, 500	12, 300	2, 256, 000	4, 999, 800
Arkansas	38, 200	330, 700	0	4, 800	69, 300	10, 000	0	1, 371, 400	1, 824, 400
California	2, 307, 200	1, 617, 300	1, 688, 000	272, 400	708, 100	533, 500	210, 800	7, 577, 000	14, 914, 300
Colorado	1, 385, 100	1, 393, 300	485, 100	20, 600	988, 500	52, 400	25, 000	5, 557, 300	9, 907, 300
Florida	81, 400	590, 800	0	27, 000	700	10, 900	0	494, 400	1, 205, 200
Georgia	92, 300	722, 500	0	2, 000	8, 000	1, 700	0	535, 600	1, 362, 100
Idaho	600, 700	497, 400	206, 700	31, 100	101, 300	35, 700	41, 900	1, 780, 400	3, 295, 200
Illinois	500	114, 000	0	0	0	0	0	212, 600	327, 100
Indiana	400	16, 500	0	0	0	0	0	126, 000	142, 900
Kansas	0	4, 000	0	0	0	0	0	1, 800	5, 800
Kentucky	24, 500	164, 900	0	3, 500	36, 100	4, 000	0	402, 800	635, 800
Louisiana	300	167, 000	0	15, 000	85, 900	10, 000	0	120, 100	398, 300
Maine	600	13, 100	0	200	0	0	0	28, 500	42, 400
Michigan	90, 400	226, 500	150, 700	8, 100	5, 900	9, 000	0	1, 903, 100	2, 393, 700
Minnesota	180, 500	93, 200	25, 500	3, 900	19, 400	11, 800	120, 000	1, 041, 000	1, 495, 300
Mississippi	3, 000	144, 000	0	7, 400	15, 000	0	0	440, 900	610, 300
Missouri	10, 200	142, 400	0	600	0	0	0	948, 000	1, 101, 200
Montana	352, 400	447, 600	158, 900	19, 900	41, 200	62, 700	26, 700	3, 538, 600	4, 648, 000
Nebraska	2, 000	40, 100	0	0	0	0	0	120, 600	162, 700
Nevada	109, 600	208, 200	43, 900	14, 400	0	1, 800	100	151, 300	529, 300
New Hampshire	79, 500	436, 200	159, 100	3, 700	69, 700	0	2, 400	1, 996, 400	2, 747, 000
New Mexico	397, 900	1, 147, 400	66, 100	18, 700	1, 700	11, 300	22, 800	1, 531, 400	3, 197, 300
North Carolina	409, 100	1, 079, 000	0	10, 500	13, 300	3, 100	14, 000	1, 619, 800	3, 148, 800
North Dakota	0	0	0	0	0	0	0	29, 200	29, 200
Ohio	5, 000	52, 500	0	0	0	0	0	97, 700	155, 200
Oklahoma	2, 000	113, 000	0	0	0	0	0	19, 800	134, 800
Oregon	1, 303, 600	1, 091, 400	432, 300	42, 100	1, 411, 100	65, 600	39, 100	2, 037, 700	6, 422, 900
Pennsylvania	22, 900	220, 200	0	14, 500	0	23, 100	0	811, 200	1, 091, 900
South Carolina	900	260, 500	0	0	0	0	0	269, 500	530, 900
South Dakota	314, 300	784, 600	2, 300	9, 700	14, 000	15, 500	0	1, 582, 100	2, 722, 500
Tennessee	95, 500	1, 038, 300	0	20, 400	50, 000	23, 500	0	1, 002, 600	2, 230, 300
Texas	11, 600	195, 200	0	800	300	0	0	464, 500	672, 400
Utah	770, 400	2, 836, 900	403, 200	63, 400	74, 200	62, 900	38, 800	1, 983, 500	6, 233, 300
Vermont	2, 800	63, 700	268, 500	0	0	0	0	221, 700	556, 700
Virginia	46, 600	307, 400	0	7, 000	100	1, 000	0	2, 542, 700	2, 904, 800
Washington	828, 200	544, 200	427, 800	46, 600	193, 400	55, 500	13, 800	1, 354, 800	3, 464, 300
West Virginia	196, 000	232, 900	0	10, 600	0	0	0	654, 100	1, 093, 600
Wisconsin	47, 300	148, 500	16, 800	1, 000	400	1, 800	0	374, 000	589, 800
Wyoming	314, 800	354, 300	80, 700	24, 200	192, 500	42, 900	46, 600	2, 142, 300	3, 198, 300
Puerto Rico	0	144, 400	0	3, 600	83, 700	6, 800	0	26, 300	264, 800
Total	10, 878, 000	19, 800, 800	4, 706, 800	751, 000	4, 575, 500	1, 114, 200	614, 300	50, 153, 900	92, 594, 500

TABLE 8.—*Fires controlled by Forest Service fire organizations to protect National Forest lands, and area burned, calendar year 1960*

State	Fires						Area burned	
	Lightning	Smoking	Recreation	Incendiary	Other	Total	National Forest	Other ownerships
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Acres*	*Acres*
Alabama	20	31	13	48	31	143	597	662
Alaska		1	3		17	21	51	
Arizona	1, 723	48	95	11	84	1, 961	21, 793	4, 310
Arkansas	31	38	34	16	54	173	1, 426	503
California	1, 675	253	150	93	410	2, 581	169, 484	33, 017
Colorado	199	41	76	1	39	356	2, 562	1, 472
Florida	42	25	8	23	24	122	1, 191	221
Georgia	2	19	14	13	34	82	214	562
Idaho	648	80	65	2	89	884	46, 726	6, 304
Illinois		6		4	12	22	23	117
Indiana		10	2	4	6	22	151	158
Kentucky		17	8	7	25	57	287	219
Louisiana	6	12	10	58	33	119	6, 113	851
Michigan	1	19	18		37	75	182	256
Minnesota	27	33	50	21	39	170	333	307
Mississippi	8	24	30	181	61	304	3, 479	2, 470
Missouri	13	55	68	130	88	354	2, 192	2, 008
Montana	721	74	66		122	983	3, 096	
Nebraska	8				2	10	850	123
Nevada	42	5	4		5	56	1, 752	273
New Mexico	823	41	49	5	23	941	2, 345	1, 000
North Carolina	6	26	30	16	63	141	324	573
Ohio		16	2	4	30	52	188	164
Oklahoma		5	2	6	9	22	439	351
Oregon	997	112	241	15	159	1, 524	54, 624	7, 589
Pennsylvania			6		2	8	4	
South Carolina	4	16	15	67	41	143	457	571
South Dakota	153	5	9	3	34	204	5, 416	8, 556
Tennessee	5	12	12	36	11	76	449	115
Texas	2	22	5	28	16	73	198	171
Utah	193	35	64	9	45	346	1, 063	1, 660
Vermont		1	2		1	4		1
Virginia	5	28	22	12	34	101	394	400
Washington	166	59	130	2	84	441	9, 653	7, 663
West Virginia	6	5	10	4	6	31	94	34
Wisconsin		10	7	3	3	23	38	25
Wyoming	133	20	33		12	198	2, 533	840
Total	7, 659	1, 204	1, 353	822	1, 785	12, 823	340, 721	83, 546

TABLE 9.—*Forest fires on protected State and private lands, and area burned, calendar year 1960; and expenditures for control, fiscal year 1960* [1]

State	Area protected	Fires	Area burned	Prevention and suppression expenditures			
				Federal	State and county	Private [2]	Total
	Thousand acres	*Number*	*Acres*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	19, 990	5, 975	116, 240	339, 100	882, 746	154, 146	1, 375, 992
Alaska	60	69	614				
Arkansas	16, 535	3, 120	297, 449	273, 400	802, 163	84, 970	1, 160, 533
California	19, 810	2, 373	121, 512	1, 185, 400	14, 201, 962		15, 387, 362
Colorado	7, 407	446	9, 395	33, 000	86, 023		119, 023
Connecticut	1, 989	355	1, 309	44, 100	139, 923		184, 023
Delaware	453	37	177	11, 500	13, 039		24, 539
Florida	17, 231	5, 216	111, 462	563, 800	2, 438, 318	608, 656	3, 610, 774
Georgia	21, 767	8, 338	73, 843	513, 900	2, 422, 562	37, 737	2, 974, 199
Hawaii	1, 152	34	22, 700	15, 000	19, 768		34, 768
Idaho	7, 343	575	80, 097	151, 100	448, 335	146, 996	746, 431
Illinois	3, 170	250	5, 997	45, 600	147, 147		192, 747
Indiana	3, 931	311	9, 509	39, 315	110, 845		150, 160
Iowa	2, 277	5	36	26, 000	34, 209		60, 209
Kentucky	7, 779	2, 374	99, 505	144, 200	387, 563		531, 763
Louisiana	11, 899	6, 356	114, 157	324, 600	1, 499, 992	18, 823	1, 843, 415
Maine	16, 973	472	2, 810	238, 400	905, 062		1, 143, 462
Maryland	2, 850	360	1, 777	109, 800	513, 916		623, 716
Massachusetts	3, 252	4, 475	5, 069	113, 700	388, 486		502, 186
Michigan	17, 205	565	3, 194	414, 800	1, 860, 729		2, 275, 529
Minnesota	17, 771	1, 151	91, 867	268, 700	853, 035		1, 121, 735
Mississippi	14, 276	7, 904	133, 416	311, 200	1, 475, 404		1, 786, 604
Missouri	9, 597	2, 384	52, 937	206, 100	701, 523		907, 623
Montana	6, 915	471	13, 562	102, 400	97, 123	217, 294	416, 817
Nebraska	450	86	20, 046	5, 000	5, 000		10, 000
Nevada	2, 216	100	2, 720	32, 300	153, 519		185, 819
New Hampshire	4, 182	305	176	71, 600	190, 802	7, 221	269, 623
New Jersey	2, 095	1, 136	20, 424	98, 100	412, 060		510, 160
New Mexico	1, 594	93	129	30, 000	32, 185	11, 808	73, 993
New York	12, 995	714	5, 065	226, 400	1, 076, 968		1, 303, 368
North Carolina	17, 276	3, 064	76, 514	311, 600	1, 273, 212	31, 084	1, 615, 896
North Dakota	121	6	2, 835	5, 844	5, 844		11, 688
Ohio	3, 923	969	5, 571	88, 900	292, 909		381, 809
Oklahoma	4, 488	611	95, 474	134, 200	130, 496	30, 330	295, 026
Oregon	12, 141	998	24, 680	541, 600	2, 200, 494	535, 502	3, 277, 596
Pennsylvania	14, 704	1, 259	33, 339	190, 600	767, 014		957, 614
Rhode Island	434	124	901	37, 000	95, 931		132, 931
South Carolina	11, 175	3, 947	39, 691	299, 500	1, 160, 993		1, 460, 493
South Dakota	2, 827	120	15, 378	30, 500	49, 481		79, 981
Tennessee	10, 171	3, 052	29, 941	264, 400	865, 646	2, 221	1, 132, 267
Texas	9, 384	1, 557	49, 386	240, 500	547, 715	88, 732	876, 947
Utah	5, 338	365	11, 244	34, 700	75, 713		110, 413
Vermont	3, 517	122	183	30, 000	59, 820		89, 820
Virginia	14, 033	1, 506	6, 907	256, 500	889, 261	5, 342	1, 151, 103
Washington	12, 237	973	32, 424	547, 000	2, 434, 530	200, 000	3, 181, 530
West Virginia	9, 007	1, 490	59, 383	123, 400	314, 939		438, 339
Wisconsin	15, 297	1, 253	6, 078	320, 700	1, 588, 394		1, 909, 094
Wyoming	1, 563	71	1, 581	5, 500	6, 406		11, 906
Total	402, 800	77, 537	1, 908, 704	9, 400, 959	45, 059, 205	2, 180, 862	56, 641, 026

[1] This table does not include 13,760 fires and 1,947,121 acres burned on 32 million acres of unprotected lands.
[2] Private expenditures, spent under direct supervision of State forester, as part of the Clarke-McNary program.

TABLE 10.—*Distribution of forest and windbarrier planting stock by cooperating States, fiscal year 1960 (under Clarke-McNary program)*

State	Seedlings and transplants shipped	Expenditures			
		Federal funds	State appropriated funds	Receipts from sale of stock used in program	All sources
	Thousands	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	93, 284	0	0	297, 493	297, 493
Alaska	0	0	0	0	0
Arizona	0	0	0	0	0
Arkansas	42, 902	0	0	126, 711	126, 711
California	2, 360	4, 200	46, 164	25, 896	76, 260
Colorado	358	9, 241	17, 341	20, 046	46, 628
Connecticut	1, 493	4, 200	12, 701	27, 535	44, 436
Delaware	1, 072	4, 700	16, 609	0	21, 309
Florida	80, 503	4, 200	35, 113	328, 139	367, 452
Georgia	85, 584	0	0	349, 870	349, 870
Hawaii	449	4, 200	111, 248	0	115, 448
Idaho	688	5, 600	15, 007	8, 974	29, 581
Illinois	6, 343	4, 200	26, 475	105, 210	135, 885
Indiana	5, 286	6, 007	135, 773	88, 196	229, 976
Iowa	1, 107	0	0	39, 350	39, 350
Kansas	519	4, 219	4, 219	25, 617	34, 055
Kentucky	15, 813	7, 202	87, 016	125, 740	219, 958
Louisiana	74, 937	5, 000	88, 756	271, 873	365, 629
Maine	292	7, 352	17, 482	5, 433	30, 267
Maryland	4, 919	5, 200	40, 093	1, 007	46, 300
Massachusetts	631	4, 200	20, 179	16, 221	40, 600
Michigan	31, 498	5, 514	177, 965	112, 924	296, 403
Minnesota	14, 982	4, 200	321, 143	76, 058	401, 401
Mississippi	80, 366	0	0	285, 055	285, 055
Missouri	2, 906	4, 200	73, 555	11, 819	89, 574
Montana	1, 183	5, 600	8, 185	37, 977	51, 762
Nebraska	1, 804	0	0	62, 988	62, 988
Nevada	40	4, 200	6, 216	0	10, 416
New Hampshire	1, 080	6, 201	17, 056	12, 392	35, 649
New Jersey	618	3, 200	4, 130	15, 008	22, 338
New Mexico	45	3, 870	4, 429	1, 504	9, 803
New York	22, 126	4, 200	198, 787	154, 879	357, 866
North Carolina	40, 308	5, 000	91, 361	138, 957	235, 318
North Dakota	584	4, 200	29, 394	11, 002	44, 596
Ohio	13, 825	4, 200	105, 079	132, 464	241, 743
Oklahoma	3, 754	5, 200	18, 146	19, 177	42, 523
Oregon	6, 669	5, 600	30, 995	59, 420	96, 015
Pennsylvania	11, 620	4, 200	133, 232	71, 425	208, 857
Puerto Rico	1, 210	4, 200	21, 360	0	25, 560
Rhode Island	382	3, 629	3, 629	3, 477	10, 735
South Carolina	53, 042	0	1, 060	158, 157	159, 217
South Dakota	1, 777	1, 743	1, 743	34, 518	38, 004
Tennessee	37, 563	0	0	103, 817	103, 817
Texas	29, 027	5, 000	55, 014	145, 959	205, 973
Utah	106	3, 843	3, 843	6, 279	13, 965
Vermont	1, 989	6, 695	28, 418	24, 154	59, 267
Virginia	31, 842	5, 200	51, 580	148, 432	205, 212
Washington	8, 261	0	35, 715	52, 185	87, 900
West Virginia	4, 350	0	28, 898	67, 229	96, 127
Wisconsin	22, 914	4, 200	74, 165	367, 359	445, 724
Wyoming	188	2, 172	2, 172	7, 220	11, 564
Total	844, 599	185, 988	2, 201, 446	4, 185, 146	6, 572, 580

TABLE 11.—*Planting stock available for forest and windbarrier planting on State and private lands, area planted or seeded, and plantable area, by State and Commonwealth*

State and Commonwealth	Planting stock shipped, fiscal year 1960			Area planted or seeded fiscal year 1960 [2]	Plantable area as of Jan. 1, 1953 [3]
	State nurseries	Other	Total [1]		
	Thousands	*Thousands*	*Thousands*	*Acres*	*Acres*
Alabama	140, 810	19, 337	160, 147	182, 182	1, 675, 000
Arizona	0	0	0	276	18, 000
Arkansas	65, 902	0	65, 902	65, 968	1, 408, 000
California	3, 939	7, 310	11, 249	7, 576	3, 357, 000
Colorado	373	121	494	1, 474	295, 000
Connecticut	2, 115	0	2, 115	1, 351	205, 000
Delaware	1, 072	0	1, 072	793	34, 000
Florida	127, 661	94, 440	222, 101	192, 859	4, 859, 000
Georgia	234, 409	76, 961	311, 370	325, 845	1, 566, 000
Hawaii	512	0	512	600	----------
Idaho	681	120	801	2, 158	265, 000
Illinois	8, 003	0	8, 003	6, 343	2, 856, 000
Indiana	7, 233	375	7, 608	4, 831	1, 290, 000
Iowa	865	237	1, 102	1, 477	613, 000
Kansas	0	2, 450	2, 450	1, 494	915, 000
Kentucky	13, 392	880	14, 272	16, 855	1, 500, 000
Louisiana	106, 597	44, 605	151, 202	180, 620	1, 139, 000
Maine	2, 605	0	2, 605	4, 745	472, 000
Maryland	6, 149	0	6, 149	6, 657	250, 000
Massachusetts	694	0	694	694	114, 000
Michigan	20, 426	62, 592	83, 018	47, 360	2, 905, 000
Minnesota	26, 202	4, 200	30, 402	27, 651	2, 410, 000
Mississippi	100, 556	51, 338	151, 894	162, 638	4, 187, 000
Missouri	5, 828	500	6, 328	7, 766	1, 267, 000
Montana	1, 225	894	2, 119	2, 450	214, 000
Nebraska	0	5, 508	5, 508	6, 490	968, 000
Nevada	40	0	40	52	28, 000
New Hampshire	2, 052	150	2, 202	2, 052	309, 000
New Jersey	1, 144	130	1, 274	668	93, 000
New Mexico	0	0	0	357	1, 250, 000
New York	43, 035	1, 332	44, 367	40, 311	97, 000
North Carolina	83, 057	10, 000	93, 057	70, 615	898, 000
North Dakota	1, 329	7, 190	8, 519	12, 223	742, 000
Ohio	16, 457	188	16, 645	15, 581	729, 000
Oklahoma	4, 590	0	4, 590	4, 693	876, 000
Oregon	11, 262	8, 008	19, 270	63, 592	969, 000
Pennsylvania	15, 248	25, 927	41, 175	40, 223	1, 080, 000
Rhode Island	0	0	0	317	39, 000
South Carolina	147, 146	19, 300	166, 446	177, 341	1, 169, 000
South Dakota	501	5, 820	6, 321	8, 314	702, 000
Tennessee	38, 112	30, 269	68, 381	46, 639	1, 465, 000
Texas	34, 850	25, 690	60, 540	66, 434	539, 000
Utah	76	0	76	184	37, 000
Vermont	5, 341	0	5, 341	7, 122	99, 000
Virginia	24, 696	12, 200	36, 896	34, 672	1, 799, 000
Washington	11, 543	22, 708	34, 251	55, 780	751, 000
West Virginia	5, 100	0	5, 100	4, 733	989, 000
Wisconsin	35, 232	9, 379	44, 611	50, 212	2, 685, 000
Wyoming	0	42	42	533	95, 000
Puerto Rico	1, 246	0	1, 246	2, 173	----------
Total	1, 359, 306	550, 201	1, 909, 507	1, 963, 974	52, 222, 000

[1] Represents planting stock produced within each State; adjusted for known significant shipments of stock from one State to another.

[2] Includes 137,263 acres of direct seeding primarily in Alabama, Louisiana, Oregon, and Washington. It is estimated that not more than 80 percent of these plantings and seedings are successful.

[3] Figures are those reported in "Timber Resources for America's Future." Alaska, Hawaii, and Puerto Rico were not included in the timber resources study.

TABLE 12.—*Cooperative forest management accomplishments and expenditures, fiscal year 1960* [1]

(U.S. Forest Service and State foresters cooperating in 452 projects)

State and Commonwealth	Accomplishments				Expenditures		
	Woodland owners assisted	Woodland involved	Products harvested	Gross sale value	Federal	State	Total
	Number	*Acres*	*M bd. ft.*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	625	74, 732	16, 283	473, 497	20, 961	20, 961	41, 922
Arkansas	1, 240	82, 831	1, 527	40, 294	25, 575	36, 907	62, 482
California	1, 330	187, 023	63, 596	1, 126, 105	28, 820	59, 153	87, 973
Colorado	192	63, 566	1, 071	18, 114	10, 000	11, 224	21, 224
Connecticut	1, 525	23, 278	1, 616	48, 938	18, 540	22, 382	40, 922
Delaware	75	3, 707	193	8, 785	3, 505	3, 722	7, 227
Florida	3, 257	862, 423	21, 422	720, 538	55, 970	163, 768	219, 738
Georgia	3, 599	282, 191	23, 431	648, 044	53, 090	130, 594	183, 684
Idaho	321	25, 589	70, 288	41, 990	6, 750	9, 800	16, 550
Illinois	1, 490	35, 004	3, 526	169, 880	41, 294	43, 930	85, 224
Indiana	1, 479	52, 008	6, 500	280, 999	12, 670	65, 943	78, 613
Iowa	829	14, 421	332	26, 720	14, 698	36, 025	50, 723
Kansas	135	3, 474	291	10, 844	5, 000	5, 081	10, 081
Kentucky	2, 457	56, 684	3, 484	103, 370	45, 875	70, 464	116, 339
Louisiana	360	50, 574	3, 945	88, 099	26, 320	29, 972	56, 292
Maine	2, 219	61, 264	18, 377	304, 906	38, 725	83, 515	122, 240
Maryland	1, 530	29, 957	8, 074	251, 353	34, 505	55, 380	89, 885
Massachusetts	701	8, 030	2, 815	54, 751	8, 690	9, 319	18, 009
Michigan	2, 546	84, 041	12, 755	325, 170	52, 367	75, 337	127, 704
Minnesota	3, 676	52, 796	10, 970	324, 844	24, 415	38, 818	63, 233
Mississippi	1, 441	116, 327	3, 363	82, 678	26, 995	41, 373	68, 368
Missouri	1, 442	154, 585	7, 929	221, 585	56, 671	66, 026	122, 697
Montana	318	44, 125	1, 332	15, 536	14, 122	27, 905	42, 027
Nebraska	387	2, 238	83	9, 246	6, 000	6, 154	12, 154
Nevada	8	6, 200	1, 000	40, 000	2, 000	3, 231	5, 231
New Hampshire	2, 867	92, 532	5, 832	158, 904	28, 004	37, 590	65, 594
New Jersey	886	58, 699	3, 012	86, 365	22, 835	36, 112	58, 947
New Mexico	46	37, 605	3, 146	25, 568	17, 520	18, 191	35, 711
New York	6, 069	224, 606	26, 167	974, 345	91, 343	147, 611	238, 954
North Carolina	4, 637	108, 420	16, 656	493, 730	53, 845	85, 827	139, 672
North Dakota	319	3, 543	502	32, 630	7, 547	19, 480	27, 027
Ohio	2, 531	71, 955	5, 115	204, 149	53, 425	88, 052	141, 477
Oklahoma	705	4, 255	10	1, 305	7, 446	7, 446	14, 892
Oregon	1, 854	65, 154	5, 369	226, 780	16, 162	36, 989	53, 151
Pennsylvania	2, 785	42, 042	5, 219	153, 051	49, 326	101, 867	151, 193
Rhode Island	262	7, 849	251	5, 158	4, 360	5, 577	9, 937
South Carolina	3, 137	243, 980	20, 426	660, 032	39, 388	78, 470	117, 858
South Dakota	156	9, 775	2, 051	26, 575	12, 000	20, 835	32, 835
Tennessee	958	91, 723	9, 253	317, 016	30, 469	40, 940	71, 409
Texas	767	128, 889	915	12, 944	23, 960	28, 505	52, 465
Utah	40	645	12	1, 075	3, 890	3, 890	7, 780
Vermont	3, 119	58, 961	12, 133	313, 312	52, 522	58, 182	110, 704
Virginia	4, 022	196, 714	166, 965	3, 906, 537	83, 870	186, 111	269, 981
Washington	2, 854	107, 301	6, 457	179, 977	19, 765	42, 566	62, 331
West Virginia	2, 413	42, 720	5, 558	305, 247	33, 107	51, 417	84, 524
Wisconsin	7, 674	140, 722	16, 919	560, 353	77, 617	253, 147	330, 764
Total, U.S.	81, 283	4, 115, 158	596, 171	14, 081, 339	1, 361, 959	2, 465, 789	3, 827, 748
Puerto Rico	905	454	7	1, 370	8, 500	18, 622	27, 122
Grand total	82, 188	4, 115, 612	596, 178	14, 082, 709	1, 370, 459	2, 484, 411	3, 854, 870

[1] Performed under authority of Cooperative Forest Management Act of Aug. 25, 1950.

TABLE 13.—*Pest control accomplishments and costs, calendar year 1960*

WHITE PINE BLISTER RUST

Ownership	Premaintenance work to establish control of ribes by eradication		Maintenance work to control ribes by eradication		Ribes plants eradicated	Area on which control was established by eradication	Ribes control by antibiotics		
	Area surveyed [1]	Area on which ribes were eradicated	Area surveyed [1]	Area on which ribes were eradicated			Area surveyed [2]	Area treated	White pines treated
	Acres	*Acres*	*Acres*	*Acres*	*Number*	*Acres*	*Acres*	*Acres*	*Number*
USDA, National Forests	142, 532	41, 213	85, 481	10, 020	3, 592, 000	29, 987	2, 407, 450	36, 222	7, 480, 698
Department of the Interior:									
National Parks	12, 228	12, 289	17, 443	6, 927	813, 000	10, 215	10, 570	2, 360	99, 000
Bureau of Land Management	23, 674	1, 324	2, 791	10	38, 000	560	----------	40	3, 711
Indian Lands	3, 377	1, 902	4, 060	2, 859	293, 000	940	----------	----------	----------
Subtotal, USDI	39, 279	15, 515	24, 294	9, 796	1, 144, 000	11, 715	10, 570	2, 400	102, 711
Total Federal	181, 811	56, 728	109, 775	19, 816	4, 736, 000	41, 702	2, 418, 020	38, 622	7, 583, 409
Non-Federal	550, 459	108, 447	1, 278, 965	39, 150	3, 981, 000	110, 743	610, 460	6, 420	951, 000
Total, all ownerships	732, 270	165, 175	1, 388, 740	58, 966	8, 717, 000	152, 445	3, 028, 480	45, 042	8, 534, 409

OAK WILT

Ownership	Area surveyed	Trees treated	Funds expended		
			Federal	State	Total
	Thousand acres	*Number*	*Dollars*	*Dollars*	*Dollars*
National Forest:					
Cumberland	457	5	500	----------	500
Monongahela	967	15	807	----------	807
Ozark	1, 000	----------	1, 130	----------	1, 130
Jefferson	543	----------	1, 341	----------	1, 341
George Washington	900	166	4, 503	----------	4, 503
Total	3, 867	186	8, 281	----------	8, 281
State and private:					
Arkansas	8, 000	272	3, 010	6, 019	9, 029
Kentucky	4, 600	796	17, 130	36, 766	53, 896
North Carolina	1, 250	74	2, 509	5, 018	7, 527
Pennsylvania	12, 000	781	12, 650	37, 945	50, 595
Virginia	8, 000	84	1, 448	4, 346	5, 794
West Virginia	10, 000	3, 402	21, 456	86, 785	108, 241
Total	43, 850	5, 409	58, 203	176, 879	235, 082
Total, all ownerships	47, 717	5, 595	66, 484	176, 879	243, 363

INSECTS

Ownership	Bark beetles		Defoliators		Other insects	
	Trees treated [3]	Control costs	Area treated	Control costs	Area treated	Control costs
	Number	*Dollars*	*Acres*	*Dollars*	*Acres*	*Dollars*
National Forests	935, 428	[3] 1, 624, 797	138, 225	[3] 261, 848	3, 314	[4] 19, 641
State and private	137, 021	125, 953	236, 710	163, 531	749	20, 835
Total	1, 072, 449	1, 750, 750	374, 935	425, 379	4, 063	40, 476

[1] Systematically surveyed to locate area in need of Ribes eradication and to determine effectiveness of control.
[2] Inspected to determine where antibiotic treatment is feasible and justified from the cost-benefit standpoint.
[3] Includes infested trees, cull logs, and stumps.
[4] Includes Federal participation on cooperative projects on non-Federal lands.

TABLE 14.—*Statement of Forest Service receipts and expenditures, all programs and sources, fiscal year 1960*

Item	Receipts	Expenditures
	Dollars	*Dollars*
National Forest programs:		
Cash receipts and appropriation expenditures	172, 756, 535	163, 309, 267
Noncash income and expense (roads built by timber purchasers)	47, 439, 149	47, 439, 149
Total	220, 195, 684	210, 748, 416
Forest research programs:		
Forest research appropriations		14, 523, 228
Cooperative research work	1, 028, 308	919, 255
Total	1, 028, 308	15, 442, 483
State and private forestry programs:		
Fire protection, tree distribution, and forest management cooperation		12, 316, 246
Soil bank program		1, 329, 120
Assistance to States for tree planting		1, 776
Great Plains Conservation Program		31, 288
Insect and disease control		1, 162, 283
Flood prevention and watershed protection		1, 461, 022
Forest fire prevention "Smokey Bear"	14, 411	10, 477
Cooperator funds	1, 843, 850	1, 798, 302
Total	1, 858, 261	18, 110, 514
Work for other government agencies and nongovernment persons and firms:		
Insect and disease control (Interior Department lands)		100, 408
Miscellaneous work for other government agencies	3, 775, 725	4, 166, 007
Work performed for nongovernment persons, firms, etc., cooperative work	2, 841, 246	2, 399, 587
Reimbursed	537, 695	537, 695
Total	7, 154, 666	7, 203, 697
Total receipts and expenditures	230, 236, 919	251, 505, 110
Cash receipts distributed to States, counties, and Puerto Rico as directed by Congress (receipts of fiscal year 1959 except as indicated):		
Payments to States and Puerto Rico (Act 5/23/08), National Forest fund		[1] 29, 668, 588
Payments to school funds, Arizona and New Mexico (Act 6/20/10), National Forest fund		113, 861
Payment to Minnesota (Cook, Lake, and St. Louis Counties) (Superior National Forest) (Act 6/22/48), National Forest fund		121, 309
Payment to counties, National Grasslands, and land utilization areas (Act 7/22/37) (receipts of calendar year 1959)		452, 894
Total		30, 356, 652
Internal equipment and supply services (working capital fund): Financed primarily by charges included above to Forest Service programs	16, 917, 000	17, 366, 145

[1] Does not include approximately $2,035,418 due counties from fiscal year 1959 receipts on National Forest O&C lands. This amount was included in total receipts of $2,713,891 transferred to Interior for distribution under act of Aug. 28, 1937 (50 Stat. 874), as amended.

NOTE: Expenditures are on an obligation basis.

Growth Through Agricultural Progress

U.S. GOVERNMENT PRINTING OFFICE: 1961